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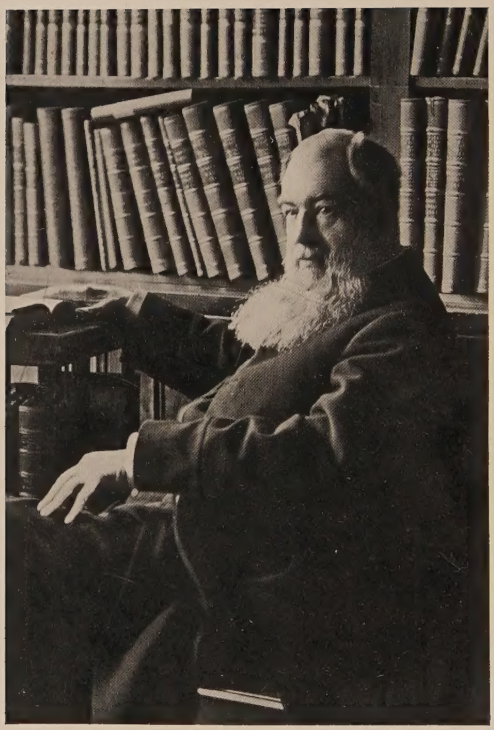

Yours very truly
A. D. Gibson

THE BRITISH TUNICATA

AN UNFINISHED MONOGRAPH

BY THE LATE
JOSHUA ALDER

AND THE LATE
ALBANY HANCOCK, F.L.S.

EDITED BY
JOHN HOPKINSON, F.L.S., F.G.S., F.Z.S.,
Secretary of the Ray Society

VOLUME III

AGGREGATÆ
(*Ascidiæ Compositæ*)

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PREFACE.

Very little need be said by way of preface to the present volume, for the history of the work by Canon Norman in the first volume forms a most appropriate preface to the whole monograph.

There he relates how Joshua Alder prepared for the British Museum a 'Catalogue of British Tunicata'; how when the publication of such Catalogues was for want of funds discontinued, Alder sought the aid of his friend Albany Hancock in working out the anatomy and physiology of the Class with a view to rendering the work suitable for publication by the Ray Society; how, after its acceptance by the Society, the death of Alder in 1867 and of Hancock in 1873 put a stop to its completion; and finally how the MS. and drawings were entrusted to Prof. Huxley who undertook their preparation for publication, but after an interval of four years returned them as he found that he could not spare time to prepare them for the press. Canon Norman then relates how on his suggestion the work was again offered to the Ray Society.

The MS. (a transcript of the original which had been lost), and the drawings, were placed in my hands early in January, 1904, and at a meeting of the Council in the same month the work was for the second time accepted for publication by the Society. The first volume was issued in April, 1905, the second in January, 1907, and by the publication of the present volume it is completed.

It is not however a complete work, being as stated on the title-page "an unfinished monograph," and this in a double sense, for the authors had not

completed the description of all the species even in the first genus, *Ascidia*, there being blanks in the MS. intended to be filled up, and these gradually become more frequent; while the pelagic forms, *Salpa*, *Pyrosoma*, *Appendicularia*, &c., are not treated of at all. But the fixed forms frequenting our shores are of most general interest, at least to the amateur naturalist, and this account of them renders fairly easy the identification of the species known at the time the authors wrote. Since then others have been discovered, and the classification and nomenclature of the Tunicata have been much altered. Even their position in the Animal Kingdom has been raised from the invertebrate Molluscoidea to the degenerate pseudo-vertebrate Urochordata, a Class of the Chordata formed for their reception.

In the preparation of the first two volumes I had the advantage of the much valued assistance of Canon Norman, and I greatly regret that owing to failing health he has been unable to continue that assistance with the present volume. To him we owe the appearance of the work which throughout bears evidence of his assiduous collecting, the material supplied by him being far more extensive than that contributed by any other of the authors' friends, and in the number of new species surpassing even their own collections. His portrait, by my request to him, forms the frontispiece to this volume.

When I commenced the preparation of the monograph I intended to add to the concluding volume a Bibliography of the Tunicata, but that has so greatly exceeded its anticipated extent that it must appear as a separate volume, a necessary adjunct, however, to the monograph on account of the abbreviation of the titles of works quoted in it.

JOHN HOPKINSON.

WEETWOOD, WATFORD.
30th December, 1911.

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NOTE ON THE ILLUSTRATIONS.

As many species described in the present volume were not figured by the authors, including nearly all those originally described by Milne Edwards in his beautifully illustrated monograph, 'Observations sur les Ascidies composées des côtes de la Manche,' the Editor considered it advisable to add largely to the illustrations from that and other sources. With this view all the coloured figures in Edwards' monograph which represent British species were photographed, and are here reproduced, mostly in colour, with a few of his uncoloured figures, and also several from Savigny's classical work, 'Mémoires sur les Animaux sans Vertebrès.'

In addition to these, the earliest published figures of every other species included in the volume are reproduced, also by photography, as text-figures.

By this means, the volume, instead of being by far the most meagrely illustrated of the three, as it would otherwise have been, is, for its extent, the most richly illustrated.

All the illustrations have been executed by André & Sleigh, Ltd., of Bushey, Watford.

J. H.

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BRITISH TUNICATA.

Tribe 2. AGGREGATÆ.*

(*Compound Ascidians.*)

Individuals [intimately united, without separate tests, reproducing by gemmation, and forming fixed colonies] wholly immersed in a common envelope.

Family 5. Polyclinidæ.

Individuals much elongated, consisting of a thorax containing the branchial sac, an abdomen containing the digestive organs, and a post-abdomen containing the heart and the reproductive organs; enveloped in a common mass; branchial aperture only with lobes.

[The colony is usually massive, sometimes incrusting, and occasionally lobed or pedunculated; the systems vary in character, sometimes being imperceptible, and their common excretory orifice is usually inconspicuous; the test is gelatinous or cartilaginous; the branchial sac is small and not well developed; the dorsal lamina consists of a series of languets; the tentacles are few and small.]

* Additions to the authors' MS., except obviously editorial foot-notes, are placed within brackets, as in the previous volumes of this work. The term "common body," with which the description of each genus and species commenced, is altered to "colony"; the term "rays," for the divisions of the branchial aperture, to "lobes"; and the term "anal," when applied to the aperture of the atrium, to "atrial." Approximate dimensions in millimetres are inserted. A few corrections to references, verbal alterations, and transpositions are not indicated.

Section 1. With common excretory orifices.

Genus 14. **POLYCLINUM** Savigny, 1816.

Polyclinum Savigny Mém. Anim. sans Vert. pt. 2 [1816], p. 188; [Lamouroux Exp. méth. Polyp. (1821), p. 75;] Milne Edwards Obs. Ascidies comp. [1841],* p. 76, [in Mém. Acad. Sci. Inst. France, XVIII (1842), p. 292;] Forbes & Hanley Brit. Moll. I [1848], p. 14; Gosse Man. Marine Zool. II [1856], p. 32; Woodward Man. Moll. [pt. 3 (1856)], p. 342; H. & A. Adams Gen. Recent Moll. II [1858], p. 599.

Colony [gelatinous or cartilaginous,] polymorphous, generally more or less rounded, [usually] sessile, composed of several radiating, [often] irregular systems, each with a common excretory orifice. *Individuals* [elongated,] varying in number in each system, and placed at unequal distances from their common centres. *Branchial aperture* with six salient lobes; *atrial aperture* opening horizontally, with an even rim and a languet above projecting into the common cloacal cavity. *Thoraæ* cylindrical; *branchial sac* [rather largely developed,] with papillæ. *Abdomen* smaller than the thorax, pedunculated. *Post-abdomen* attached by a peduncle arising from the side of the abdomen, slender and much elongated. The thorax, abdomen, and post-abdomen each occupying a separate cell.

It is extremely difficult to extract the individuals of this genus entire, on account of each of the three portions into which they are divided occupying a separate cell in the common mass.

1. **Polyclinum aurantium** Milne Edwards.

(Plate LI, figs. 1–5; Plate LVI, fig. 1; and figs. 88 and 89 in text.)

Polyclinum aurantium Milne Edwards Obs. Ascidies comp. [1841], p. 76, [in Mém. Acad. Sci. Inst. France, XVIII

* The separate (or author's) copies bear this date, having apparently been issued before the *Mémoires* of the *Académie* in which the work appeared. As Alder & Hancock quote the pages of these copies, they are retained.

(1842), p. 292,] pl. i, f. 6, and pl. iii, f. 4; Forbes & Hanley Brit. Moll. I [1848], p. 14, pl. A, f. 3, and pl. B, f. 3; Alder & Hancock (?) in Trans. Tyneside Nat. Field Club, I [1848], p. 203; [Cocks in Rep. R. Cornw. Polyt. Soc. for 1849 (1850), p. 74; Gosse Man. Marine Zool. II (1856), p. 32, f. 45; H. & A. Adams Gen. Recent Moll. II (1858), pl. cxxxiv, ff. 3, 3 *a*; Ansted & Latham Channel Isl. (1862), p. 219].

Colonies [coriaceous,] sub-globular, a little depressed, and attached by a narrow base (Pl. LI, fig. 5); sometimes slightly pedunculated; frequently associated in

Fig. 88.—*Polyclinum aurantium.* About twice natural size. (M. Edwards,* pl. iii, f. 4.) *c*, branchial apertures. *i*, common cloacal orifice.

groups of unequal-sized masses connected together by creeping fibres (Pl. LI, figs. 1 and 2); colour yellowish, varying from pale yellow to yellowish orange. *Individuals* (Pl. LI, fig. 3) forming systems arranged in elliptic curves around large excretory orifices with smooth rims (fig. 88). *Branchial aperture* (fig. 89) with six lobes or small digitate prolongations; *atrial* with a rather long languet. *Thorax* cylindrical, connected with the abdomen by a short peduncle. *Branchial sac* with thirteen rows of meshes. *Abdomen*

* This and all other figures after Milne Edwards are copied from his work quoted in the synonymy.

scarcely half the size of the thorax, kidney-shaped. *Post-abdomen* fusiform, joined to the abdomen by a slender thread-like peduncle which is continued below and either terminates abruptly or is connected by branches with other individuals.

Diameter of the masses from a quarter of an inch to about an inch (6–25 mm.).

Hab.—On the under side of stones between tide-marks. [Attached to stones, in crevices of rocks, etc., at low water-mark (*Cocks*).]

England.—Cullercoats, Northumb. (*Alder & Hancock*). Bambrough, Northumb.; Douglas, Isle of Man (*Alder*). [Gwyllyn-vase, Swanpool, Pennance, etc., Falmouth, Cornwall (*Cocks*, 1849).]

Wales.—Menai Straits, Anglesey (*Alder*).

Channel Islands.—Guernsey (*Alder*).

First record.—Forbes & Hanley, 1848; [*coll.* Alder, 1847.]

Fig. 89.—A branchial aperture of *Polyclinum aurantium* in a state of dilatation. × about 35. (M. Edwards, pl. iii, f. 4 *a*.)

2. **Polyclinum succineum** Alder.

(Plate LI, fig. 6.)

Polyclinum succineum Alder in Ann. Nat. Hist. (3) XI [1863], p. 169; [Norman in Rep. Brit. Assoc. for 1868 (1869), pp. 257, 303].

Colony sub-globose, a little depressed, very transparent, amber-coloured, attached by a broad base; the surface slightly lobated. *Individuals* dispersed over the surface without apparent order, forming numerous systems each with a prominent funnel-shaped common excretory orifice of great transparency (Pl. LI, fig. 6). *Branchial aperture* 6-lobed; atrial with

a short languet. *Thorax* cylindrical, occupying more than one-third of the length of the body. *Abdomen* rounded, sessile. *Post-abdomen* about the same length as the thorax, slightly pedunculated and ending in a point below.

Diameter of the colony about three-quarters of an inch (19 mm.).

Hab.—[Base of Coralline zone (50 fathoms).]

Scotland.—North of Whalsey Lighthouse, Shetland (*Norman*).

First record.—Alder, 1863; *coll.* Norman [1861].

This species was dredged by Mr. Norman on the haddock-ground, about six miles north of Whalsey Lighthouse. It is remarkable on account of its great delicacy and the transparent funnel-shaped excretory orifices which rise considerably above the surface.

[Under the name of *Polyclinum subopacum* it was the intention of the authors to describe another form (Pl. XI, figs. 7 and 8) found by Canon Norman in Gouliot Caves, Sark, in 1865. It bears, however, such a general resemblance to *Polyclinum succineum* that it may well be considered as only a variety (var. *subopacum*) of that species.]

3. **Polyclinum cerebriforme** Alder.

(Plate LI, figs. 9–11.)

Polyclinum cerebriforme Alder in Ann. Nat. Hist. (3) XI [1863], p. 170.

Colony transversely ovate, depressed, pretty-largely attached, yellowish, becoming nearly black in spirit; the surface corrugated into brain-like folds (Pl. LI, fig. 9). *Individuals* irregularly disposed over the surface; systems few, the excretory orifices rather small, circular, with the margin very slightly produced.

Longest *diameter* of mass about three-quarters of an inch (19 mm.), shortest half an inch (12 mm.).

Hab.—Between tide-marks.

England.—Hastings, Sussex (*Bowerbank* [1864]).
Ireland.—Bantry Bay, Cork (*Norman*).
First record.—Alder, 1863; *coll.* Norman, 1858.

For a knowledge of this species we are also indebted to Mr. Norman, who procured two specimens between tide-marks on the south side of Bantry Bay, in October, 1858. It is distinguished from *P. aurantium* by the brain-like folds of the surface, as well as by its smaller and more circular common orifices (Pl. LI, fig. 9). The character of the individuals could not be satisfactorily made out.

A *Polyclinum* sent to us from Hastings by Dr. Bowerbank appears to belong to this species. The Hastings specimens (Pl. LI, figs. 10 and 11) were rather larger than those from Bantry Bay, and not so distinctly corrugated into folds over the surface. An individual extracted from the mass had the thorax rather more elongated than in *P. aurantium*; the abdomen was larger, more ovate, and scarcely divided from the thorax: the post-abdomen was attached by a very slender peduncle, becoming fusiform below and ending in an obtuse point at the base The common orifices were small, circular, and very slightly margined.

[The figures of this form so nearly resemble *P. cerebriforme* that there can scarcely be a doubt of the identity, and the above description of the individuals may therefore be considered to supplement the meagre one of the colony as seen in the Bantry Bay specimens.]

Genus 15. **AMAROUCIUM*** Milne Edwards, 1841.

Amaroucium Milne Edwards Obs. Ascidies comp. [1841], p. 67, [in Mém. Acad. Sci. Inst. France, XVIII (1842), p. 283].
Amouroucium Forbes & Hanley Brit. Moll. I [1848], p. 15; H. & A. Adams Gen. Recent Moll. II [1858], p. 601.
Amœræcium Gosse Man. Marine Zool. II [1856], p. 33.
Amorœcium Woodward Man. Moll. [pt. 3 (1856),] p. 343.

* *Amaræcium* in Alder & Hancock's MS.

Colony fleshy [or cartilaginous], massive, lobed and sessile, or turbinate and pedunculated, composed of many systems, more or less circumscribed, and each having a common cloaca and excretory orifice. *Individuals* [more or less numerous,] elongated. *Branchial aperture* 6-lobed; atrial without lobes, but with a small process or languet above projecting horizontally. [*Branchial sac* moderately developed.] *Tentacular filaments* alternately long and short. *Thorax*, *abdomen*, and *post-abdomen* united continuously (*i.e.* without peduncles), the post-abdomen more or less elongated.

This genus has a great resemblance to *Aplidium*, from which it chiefly differs in having a general excretory orifice to each system.

1. **Amaroucium proliferum** Milne Edwards.

(Pl. LII; Pl. LIII, figs. 1–3; Pl. LVI, fig. 2; and figs. 90 and 91 in text.)

Amaroucium proliferum Milne Edwards Obs. Ascidies comp. [1841], p. 67, [in Mém. Acad. Sci. Inst. France, XVIII (1842), p. 283,] pl. i, ff. 3, 3 *a*, and pl. iii, f. 2; [Thompson in Rep. Brit. Assoc. for 1843 (1844), p. 264, and in Ann. Nat. Hist. (1) XIII (1844), p. 434; Cocks in Rep. R. Cornw. Polyt. Soc. for 1849 (1850), p. 74; Rupert Jones in Todd's Cyclop. Anat. IV, pt. 40 (1850), p. 2022, f. 784; Gosse Nat. Rambles Devon. Coast (1853), p. 322; Owen Comp. Anat. Invert. Anim. ed. 2 (1855), p. 477, f. 180; Gosse Tenby (1856), p. 29; Huxley in Engl. Cyclop., Nat. Hist. IV (1856), cols. 1138, 1139, with text-figs.; Gegenbauer Grundz. vergl. Anat. (1859), p. 374, f. 100, and in Arch. f. Anat. 1862, p. 161].

[*Amauroucium proliferum* Löwig & Kölliker in Ann. Sci. Nat. (3), Zool. V (1846), pp. 221, 222, 226; Krohn in Arch. f. Anat. 1852, p. 313.]

Amouroucium proliferum Forbes & Hanley Brit. Moll. I [1848], p. 15; [Krohn in Sci. Mem., Nat. Hist. I, 4 (1853), p. 313; Norman in Zoologist, XVIII (1860), p. 7247].

[*Amœræcium proliferum* Gosse Man. Marine Zool. II (1856), p. 33, f. 46, and Year at the Shore (1856), p. 310.]

Amoroucium proliferum Thompson Nat. Hist. Ireland, IV [1856], p. 362; [Ansted & Latham Channel Isl. (1862), p. 219].

[*Amoræcium proliferum* Woodward Man. Moll. pt. 3 (1856), p. 343, pl. xxiv, f. 18 (larva).]

[*Amauræcium proliferum* Bronn Thier-Reichs, III (1861), pp. 136, 180, 192, pl. xiv, ff. 1–3, 5–15.]

[*Amarucium proliferum* Grube Insel Lussin Meersf. (1864), pp. 31, 57, and in Abh. schles. Ges. vaterl. Cultur, 1868–69 (1869), pp. 105, 125.]

[*Amaurucium proliferum* Gegenbaur Grundz. vergl. Anat. ed. 2 (1870), p. 280, f. 64.]

Colony turbinate or clavate, sometimes consisting of several masses rising from a common pedunculate base

Fig. 90.—*Amaroucium proliferum*. One and a half times natural size. (M. Edwards, pl. iii, f. 2.)

(Pl. LII and fig. 90 in text), occasionally solitary and sessile; sub-globose and rather fleshy above, more coriaceous below, where it is often covered with small grains of sand or shell; yellowish or orange-coloured, marked with red from the inclosed animals, occasionally bright scarlet. *Individuals* irregularly arranged in undefined sub-circular systems, each of which has a common excretory orifice (Pl. LIII, fig. 3). *Thorax* red. [*Branchial aperture* furnished with a membranous crown, the margin regularly six-lobed (fig. 91, *a*), and showing within it nine or ten irregularly-lobed

tentacular filaments (fig. 91, *b*).] *Branchial sac* with about fourteen rows of stomata. *Stomach* plicated; *post-abdomen* rather long.

Height of masses about an inch (25 mm.). *Length* of individuals three-tenths of an inch (8 mm.).

Fig. 91.—Branchial apertures of *Amaroucium proliferum*, dilated. × about 50. (M. Edwards, pl. iii, f. 2 *b*.) *a*, in profile. *b*, face view showing the tentacles.

Hab.—Under shelving rocks or stones near low water-mark.

England.—Not uncommon on the south and west coasts. Torbay (*Alder*) [and Ilfracombe (*Gosse*)], Devon. Falmouth (*Alder* [and *Cocks*]) and Polperro (*Laughrin* [1866]), Cornwall. Isle of Man (*Alder*).

Wales.—[Tenby (*Gosse*).] Menai Straits, Anglesey (*Alder*).

Ireland.—Belfast Bay, Antrim; [and Clew Bay, Mayo] (*Thompson*). Birtirbuy Bay, Galway (*Barlee* [and *Brady*]). Bantry Bay, Cork (*Norman*).

Channel Islands.—Guernsey (*Alder* [and *Norman*]).

First record.—Thompson, 1843.

The excretory orifice of this species closes when the animal is dead, so as to be with difficulty recognized.

2. **Amaroucium albicans** Milne Edwards.

(Plate LIII, figs. 4–6; and Pl. LVI, fig. 3.)

Amaroucium albicans Milne Edwards Obs. Ascidies comp. [1841], p. 73, [in Mém. Acad. Sci. Inst. France, XVIII (1842), p. 289, pl. i, f. 3 *b*; Thompson in Ann. Nat. Hist. (2) I (1848), p. 64].

Amoroucium albicans Thompson [in Rep. Brit. Assoc. for 1852 (1853), p. 293, and] Nat. Hist. Ireland, IV [1856], p. 362.

[*Amaroucium albicans* Grube Insel Lussin Meeresf. (1864), pp. 30, 57.]

[*Amaræcium albicans* Norman in Rep. Brit. Assoc. for 1868 (1869), p. 303.]

Colony variable, incrusting, massive, or sub-clavate and pedunculate (Pl. LIII, fig. 6), of a greyish-white colour. *Individuals* numerous, arranged in elliptical systems of various sizes, sometimes nearly circular, but more frequently elongated (Pl. LIII, fig. 5). *Thorax* and *branchial aperture* white (Pl. LVI, fig. 3), the latter cut into six conspicuous segments; *atrial aperture* with a longish process above. *Stomach* orange-coloured, plicated. *Post-abdomen* paler, moderately long and pointed below.

Height and *diameter* of the masses variable, incrusting specimens sometimes extending to two inches (50 mm.) across.

Hab.—On rocks and stones between tide-marks and at a depth of several fathoms.

England.—Bambrough, Northumb. (*Alder*).

Ireland.—[Belfast Bay, dredged (1839); and] off the Galway Coast [1840] (*Thompson*).

Channel Islands.—Guernsey [1865] (*Norman*).

First record.—Thompson, 1848.

All the British specimens we have seen have been the incrusting or massive forms. They had minute calcareous granules on the surface.

3. **Amaroucium papillosum** Alder.

(Plate LIII, fig. 7.)

Amaræcium papillosum Alder in Ann. Nat. Hist. (3) XI [1863], p. 171.

Colony depressed, sessile, yellowish fawn-coloured. *Individuals* prominent, rising into distinct papillæ over the surface (Pl. LIII, fig. 7), and forming numerous

irregular, close-set, ill-defined systems, set round wide common orifices. *Branchial aperture* with six obtuse lobes. *Thoraæ* brownish fawn-colour. *Abdomen* rather darker. *Post-abdomen* cylindrical, longish.

Diameter of mass about an inch (25 mm.); *height* about one-third as much (8 mm.). *Length* of individuals about half an inch (12 mm.).

Hab.—Shallow water.

Wales.—Menai Straits, Anglesey (*Alder*).

First record.—Alder, 1863, [*coll.* 1852].

Two specimens only were obtained by dredging.

4. **Amaroucium argus** Milne Edwards.

(Plate LIV, figs. 1–3; and figs. 92 and 93 in text.)

Amaroucium argus Milne Edwards Obs. Ascidies comp. [1841], pp. 21, 74, [in Mém. Acad. Sci. Inst. France, XVIII (1842), pp. 237, 290, pl. i, f. 4, and pl. iii, f. 1; Deshayes in Cuvier's Règne Anim., Moll. (*cir.* 1845), pl. cxxx, f. 2; Rupert Jones in Todd's Cyclop. Anat. IV, pt. 40 (1850), p. 2018, f. 782; Rymer Jones Organiz. Anim. Kingd. ed. 2 (1855), p. 486, and ed. 3 (1861), p. 484].

Amouroucium argus Forbes & Hanley Brit. Moll. I [1848], p. 16, pl. A, f. 4; [Cocks in Rep. R. Cornw. Polyt. Soc. for 1849 (1850), p. 74; H. & A. Adams Gen. Recent Moll. II (1856), pl. cxxxv, ff. 1, 1*a*; Forbes & Godwin-Austen Nat. Hist. Europ. Seas (1859), p. 158].

[*Amourœcium argus* McAndrew & Barratt in Ann. Nat. Hist. (2) XVII (1856), p. 385.]

[*Amorœcium argus* Woodward Man. Moll. pt. 3 (1856), p. 343, pl. xxiv, f. 17.]

[*Amaurœcium argus* Bronn Thier-Reichs, III (1861), pp. 136, 180, pl. xiv, f. 4.]

[*Amoroucium argus* Ansted & Latham Channel Isl. (1862), p. 219.]

Colony massive or sub-cylindrical, and sessile (Pl. LIV, fig. 2), rarely pedunculate (Pl. LIV, fig. 3), of a yellowish-orange colour inclining to olive near the base, more distinctly orange above, and pale spotted with red at the summit. *Individuals* (fig. 93) rising a little above the surface, arranged irregularly in one or more

rows around a common [excretory] orifice ; usually forming a single system (fig. 92) but sometimes two or more. *Branchial aperture* prominent, cut into six triangular segments below which in each individual are four rose-coloured [eye-like] spots. *Thoraæ* pale. *Branchial sac* with ten rows of meshes. *Stomach* bright yellow or orange, areolated. *Post-abdomen* long and slender.

Fig. 92.—*Amaroucium argus*. About five times natural size. (M. Edwards, pl. i, f. 4 *a*.)

Height of mass half to three-quarters of an inch (12 to 19 mm.).

Hab.—On rocks and stones near low water-mark.

England.—Salcombe Bay, Devon (*Hincks*). Polperro (*Laughrin* [1866]) and Falmouth (*Alder* [and *Cocks*]), Cornwall. Isle of Man (*Alder*).

Channel Islands.—Guernsey (*Alder*).

First record.—Forbes & Hanley, 1848 ; [*coll.* Alder].

This species appears to be nearly confined to our

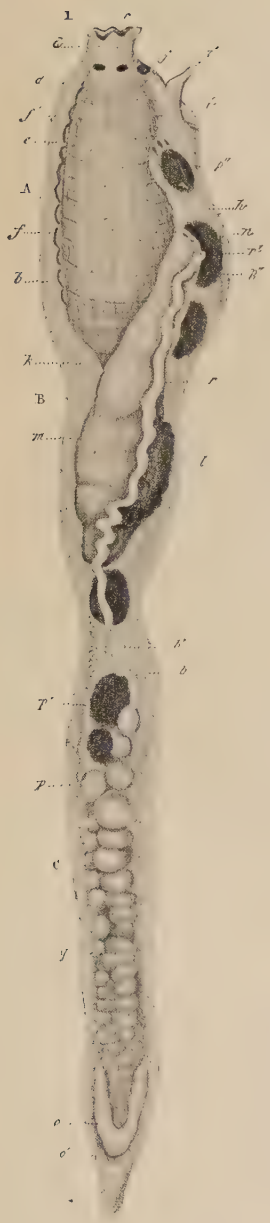

FIG. 93.—Isolated individual of *Amaroucium argus*. Much enlarged. (M. Edwards, pl. iii, f. 1.)

A, thorax.
B, superior abdomen.
C, post-abdomen.
a, proper tunic.
b, thoracic tunic.
b′, longitudinal muscular fibres of inner tunic.
c, branchial aperture.
d, branchial collar, below which are two eye-like spots.
e, branchial sac.
f, thoracic sinus.
f′, transverse vessels of branchial sac.
h, cloaca.
i, anus.
i′, languet.
j, nerve-ganglion.
k, œsophagus.
l, stomach.
m, intestine.
n, orifice of intestine.
o, heart.
o′, pericardium.
p, ovary.
p′, ova ready to pass into cloaca.
p″, ova in cloaca ready to hatch.
q, testicle.
r, vas deferens.
r′, orifice of vas deferens.

southern shores and the opposite coast of France where it was originally noticed by M. Milne Edwards.

It has considerable resemblance to *A. proliferum*, from which it can scarcely be distinguished in old spirit specimens, when the characteristic red spots are obliterated. It generally occurs, however, in smaller and more cylindrical masses. A good anatomical character confirming its distinctness as a species is found in the stomach, the surface of which is formed of little star-like areolæ, not being plicated as in *A. proliferum*.

5. **Amaroucium edentulum** Victor Carus.

Amareucium edentulum Victor Carus in Proc. Ashmol. Soc. II [(1851), p. 269].

Colony tile-red in colour, with lighter spots from the colourless apertures. *Individuals* arranged in circular or longitudinal systems of ten to forty. *Branchial aperture* with an even rim, the lobes being united by a pellucid membrane. *Thoraæ* brown. *Branchial sac* with fourteen transverse rows of stigmata. *Abdomen* pedunculated ; *stomach* with irregular folds. *Post-abdomen* only as long as the abdomen, of which it forms a continuation.

Length of individuals, one-sixth of an inch (4 mm.).

Hab.—[? Near low water-mark.]

England.—Scilly Isles (*Carus*).

First record.—Carus, 1850.

Dr. Carus states that this species is nearly allied to *A. Nordmanni*, from which it differs in the total absence of free lobes around the branchial orifice. The pedunculated abdomen is also peculiar.

6. **Amaroucium Nordmanni** Milne Edwards.

(Plate LIV, fig. 4; and figs. 94 and 95 in text.)

Amaroucium Nordmanni Milne Edwards Obs. Ascidies comp. [1841], p. 73, [in Mém. Acad. Sci. Inst. France, XVIII (1842), p. 289,] pl. i, f. 5, and pl. iii, f. 3.

[*Amaurocium Nordmanni* Löwig & Kölliker in Ann. Sci. Nat. (3), Zool. V (1846), pp. 217, 221, pl. vii, ff. 42, 43; Krohn in Arch. f. Anat. 1852, p. 314.]

Amouroucium Nordmanni Forbes & Hanley Brit. Moll. I [1848], p. 15; [Krohn in Sci. Mem., Nat. Hist. I, 4 (1853), p. 313].

[*Amauroecium Nordmanni* Bronn Thier-Reichs, III (1861), p. 180.]

[*Amoroucium Nordmanni* Ansted & Latham Channel Isl. (1862), p. 219.]

Colony [thick,] sessile, oval or sub-orbicular, broader than high (Pl. LIV, fig. 4), of a rosy tint above from

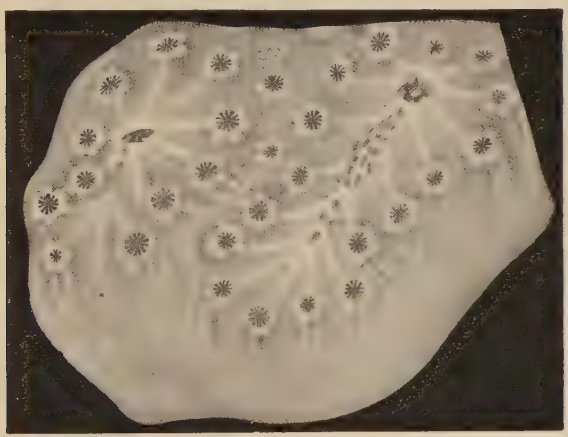

Fig. 94.—*Amaroucium Nordmanni*. About five times natural size. (M. Edwards, pl. i, f. 5 *a*.)

the enclosed individuals, paler or yellowish below. *Individuals* forming several distinctly-circumscribed elliptical or circular systems, in single rows, surrounding a sub-conical common orifice which is seldom quite central (fig. 94). *Branchial aperture* very little raised, with six obtuse, whitish lobes (fig. 95), contrasting well with the rose-colour of their base. *Thoraæ* rose-coloured. *Branchial sac* with twelve rows of meshes. *Stomach* plicated. *Post-abdomen* short and thick.

Diameter of mass about an inch and a half (38 mm.).

Hab.—Between tide-marks.

England.—Falmouth (*Alder*).
Channel Islands.—Guernsey (*Alder*).
First record.—Forbes and Hanley, 1848; [*coll.* Alder].

From its well-defined systems this beautiful species has at first sight much the appearance of a *Botryllus*.

Fig. 95.—Upper extremity of the body of *Amaroucium Nordmanni*, showing the branchial aperture. (M. Edwards, pl. iii, f. 3 *b*.)

7. **Amaroucium pomum** M. Sars.

Amaroucium pomum M. Sars in Nyt Mag. f. Naturvid. [VI (1851), p. 155, and in Förh. Vid.-Selsk. Christ. 1858 (1859), p. 66].
Amarœcium pomum Alder in Ann. Nat. Hist. (3) XI [1863], p. 170.

Colony globose, sub-cartilaginous, yellowish-grey, sessile, attached by a spreading base. *Individuals* straw-coloured, rather large, set in numerous, regular, circular or oval systems of from six to twelve in single series around a prominent central orifice with a lobed margin; the lobes corresponding with the number of individuals. *Thoraæ* yellow, pellucid. *Branchial sac* with ten to eighteen rows of stigmata. *Abdomen* shorter than the thorax, oval; stomach brownish-yellow, areolated. *Post-abdomen* long, cylindrical, acuminated below.

Diameter various. *Length* of individuals nearly half an inch (12 mm.).

Hab.—Deep water.

Scotland.—Moray Firth (*Macdonald*).
First record.—Alder, 1863; *coll.* Macdonald.

8. **Amaroucium fallax** (Johnston) *Auct.*

(Fig. 96.)

Aplidium fallax Johnston in Loud. Mag. Nat. Hist. VII [1834], p. 15, f. 4; Forbes & Hanley Brit. Moll. I [1848], p. 11 (excl. figs.); [Alder & Hancock in Trans. Tyneside Nat. Field Club, I (1848), p. 203; Cocks in Rep. R. Cornw. Polyt. Soc. for 1849 (1850), p. 73; Thompson in Rep. Brit. Assoc. for 1852 (1853), p. 293; Gosse Man. Marine Zool. II (1856), p. 32, f. 43;] Thompson Nat. Hist. Ireland, IV [1856], p. 361; [H. & A. Adams Gen. Recent Moll. II (1858), pl. cxxxiv, ff. 4, 4 *a*; Dickie in Rep. Brit. Assoc. for 1857 (1858), pp. 105, 111; Ansted & Latham Channel Isl. (1862), p. 219; Grube in Abh. schles. Ges. vaterl. Cultur, 1868–69 (1869), pp. 105, 125].

Colony (fig. 96, A) sub-globose or papillary, gelatinous, of a clear honey-yellow colour marked on the upper surface with white and brown specks from the contained animals; orifices circular, protuberant, plain, and entire. *Individuals* (fig. 96, B) scattered irregularly. *Branchial aperture* 6-lobed; atrial elongate, linear, entire. *Stomach* large, yellowish-brown, mottled.

Height of general mass about half an inch (12 mm.). *Length* of individuals two lines (4 mm.).

Hab.—On old shells from deep water. [Attached to under surface of stones, sides of rocks, etc. (*Cocks*); in 7–20 fathoms (*Dickie*).]

England.—[Falmouth, Cornwall (*Cocks*).] Isle of Man (*Forbes*).

Scotland.—Berwick Bay, Berwickshire (*Johnston*).

Ireland.—North-east coast (*Thompson*). [Strangford Lough, Castle Ward Bay, Down (*Dickie*).]

First record.—Johnston, 1834.

Dr. Johnston observes that this species "differs from *Aplidium ficus* in having the apertures in the common envelope entire, whereas in *A. ficus* they are distinctly cut into six equal rays." The weight of this observation seems doubtful, as the apertures appearing on the surface usually belong to the indivi-

duals, and these in *Amaroucium fallax* are stated to be divided into six short segments. The general body, however, in this species is smaller and less massive than in *Aplidium ficus*, and of a different colour. Forbes' figure in 'British Mollusca' (Pl. A, f. 1) does not appear to represent the same species as Johnston's. His figure in Pl. B is taken from Savigny's *Aplidium lobatum*. The presence of a languet in Dr. Johnston's

Fig. 96.—*Amaroucium fallax*. A, a group, natural size. B, a single individual, × about 16. (After Johnston, *loc. cit.*) *a*, branchial aperture; *b*, branchial sac; *c*, œsophagus; *d*, stomach; *e*, intestine; *f*, atrial aperture; *g*, ovary.

figure leads to the conclusion that this species is an *Amaroucium*.

Genus 16. **PARASCIDIA** Milne Edwards, 1845?

Parascidia Milne Edwards in [Disciples' ed.] Cuvier's Règne Anim., [Moll. by Deshayes (*cir.* 1845), Descr. pl. cxxx, fig. 3].

Colony cylindrical or turbinate, generally consisting

of several masses united by a creeping fibre or solid base. [*Test* gelatinous.] *Individuals* forming one or more systems, each having a common excretory orifice. *Branchial aperture* 8-lobed; *atrial* without lobes, having a horizontal languet above. *Tentacular filaments* alternately long and short. *Thorax* and *abdomen* united continuously. *Post-abdomen* sub-pedunculated.

M. Milne Edwards has divided this genus (or sub-genus*) from *Amaroucium* on account of its having eight lobes to the branchial aperture, while *Amaroucium*, and indeed all the other members of the same family yet discovered, have only six. As has been already remarked [Vol. I, p. 17], two of the British species have been referred to *Sidnyum*.

1. **Parascidia Forbesii** Alder.

(Plate LIV, figs. 5–7, and Pl. LVI, fig. 4.)

Sidnyum turbinatum Forbes in Brit. Moll. I [1848], p. 14, Pl. A, f. 2, and Pl. B, f. 2; [Gosse Man. Marine Zool. II (1856), p. 32, f. 44; Woodward Man. Moll. pt. 3 (1856), p. 343; H. & A. Adams Gen. Recent Moll. II (1858), pl. cxxxiv, f. 5, 5 *a*; Norman in Zoologist, XVIII (1860), p. 7247].

? *Sidnyum turbinatum* Thompson [in Ann. Nat. Hist. (1) V (1840), p. 264; in Rep. Brit. Assoc. for 1843 (1844), p. 264; and] Nat. Hist. Ireland, IV [1856], p. 361.

[Non *Sidnyum turbinatum* Savigny Mém. Anim. sans Vert. pt. 2 (1816).]

Parascidia Forbesii Alder in Ann. Nat. Hist. (3) XI (1863), p. 172, [and (MS. sp.) in Ansted's Channel Isl. (1862), p. 219].

Colony (Pl. LIV, figs. 5–7) cylindrical and truncated, nearly as broad as high, gelatinous, transparent, orange or amber-coloured, associated in closely-set masses arising from a common incrusting base. *Individuals* (Pl. LVI, fig. 4) usually forming a single system of from six to twelve, arranged around a conspicuous central orifice. *Branchial aperture* with eight palish obtuse

* Milne Edwards makes both *Amaroucium* and *Parascidia* sub-genera of *Polyclinum*.

lobes. *Thorax* orange-coloured, the branchiæ with ten or twelve rows of stigmata. *Abdomen* short, *stomach* plicated. *Post-abdomen* pedunculated, rather short and stout, ending in a distinct mucro.

Height of mass three-tenths of an inch (7 mm.). *Length* of individuals two-tenths (5 mm.).

Hab.—Under shelving rocks at low water-mark of spring tides.

England.—North coast of the Isle of Man, abundant (*Forbes*). Douglas Bay, Isle of Man (*Alder*).

Ireland.—? Belfast Bay, Antrim (*Drummond*). ? Strangford Lough, Down (*Thompson*).

Channel Islands. — Guernsey (*Alder*). Gouliot Caves, Sark (*Norman*).

First record.—Thompson, 1840; or Forbes, 1848.

This species appears to be confined to the south and west coasts. It has not yet been found on the north-east coast of England or Scotland.

2. **Parascidia Flemingii** Alder.

(Plate LIV, figs. 8 and 9; and Pl. LVI, fig. 5.)

? *Sydneum turbinatum* Fleming Brit. Anim. [1828], p. 469, and Moll. Anim. (1837), p. 212.

? *Sidnyum turbinatum* Coldstream in Edinb. new Philos. Journ. IX (1830), p. 239; Alder & Hancock in Trans. Tyneside Nat. Field Club, I [(1848), p. 203].

[Non *Sidnyum turbinatum* Savigny Mém. Anim. sans Vert. pt. 2 (1816).]

Parascidia Flemingii Alder in Ann. Nat. Hist. (3) XI [1863], p. 172, [and in Rep. Brit. Assoc. for 1866 (1867), p. 208; Norman in Rep. Brit. Assoc. for 1868 (1869), p. 303].

Colony turbinate, inversely conical, or clavate and pedunculate, tapering to a narrow base, several masses being generally associated and united by a creeping fibre (Pl. LIX, fig. 8); transparent, gelatinous, yellowish or greyish white [flesh-coloured], appearing more or less of a reddish orange from the enclosed

animals. *Individuals* (Pl. LVI, fig. 5) irregularly disposed, forming usually a single system around a central orifice with an undulating or lobed margin (Pl. LIV, fig. 9). *Branchial aperture* with eight opaque yellowish-white lobes. *Thorax* yellow, with seven or eight rows of stigmata in the branchial sac. *Stomach* orange-coloured, plicated longitudinally. *Post-abdomen* rather constricted at its junction with the thorax, stout, fusiform, orange-yellow, tapering to a red nipple-like point.

Height of mass from a quarter to half an inch (6–12 mm.). *Length* of individuals two-tenths of an inch (5 mm.).

Hab.—On rocks and the under side of stones near low water-mark.

England.—Not uncommon on the north-east coast. Tynmouth, Cullercoats, and Bambrough, Northumb. (*Alder*). Isle of Man (*Alder*).

Scotland.—? Isle of May, Firth of Forth (*Fleming*).

First record.—? Fleming, 1828; or Alder & Hancock, 1848.

This *Parascidia* seems to take the place on the north-east coast which is occupied by *Amaroucium proliferum* on the south and west. It has some general resemblance to that species, but is smaller and more delicate. Like some others of the family, it is doubly compound, the compound masses giving rise to others by gemmation from creeping tubular processes running over the stone as in the Social Ascidians. The common excretory orifice can scarcely be detected after the death of the animal.

3. **Parascidia flabellata** Alder.

Parascidia flabellata Alder in Ann. Nat. Hist. (3) XI [1863], p. 172.

Colony elongate, lobulated, transparent, consisting below of a very much-produced peduncle, which is

divided above into several oblong branches, variously lobed, forming a somewhat fan-shaped expansion at the free end; many orange masses or spots in the interior giving an orange hue to the whole. *Individuals* elongate. *Branchial aperture* 8-lobed, tinged with orange *Post-abdomen* longish, linear, and rather thin. The whole mass prettily and minutely speckled with orange.

Hab.—Hanging about a *Cellularia* in little orange transparent tufts (*Hincks*).

England.—Salcombe Bay, Devon (*Hincks*).

First record.—Alder, 1863; *coll.* Hincks, 1848.

The above account of a very interesting little *Parascidia* is extracted from manuscript notes by Mr. Hincks of Tunicata got at Salcombe in 1848. There can be no doubt of its distinctness from any species yet described.

Section 2. Without common excretory orifices.

Genus 17. **APLIDIUM** Savigny.

Aplidium Savigny Mém. Anim. sans Vert. pt. 2 [1816], p. 181; [Lamarck Hist. nat. Anim. s. Vert. III (1816), p. 94, and ed. 2, III (1840), p. 488; Lamouroux Exp. méth. Polyp. (1821), p. 74;] Forbes & Hanley Brit. Moll. I [1848], p. 10; H. & A. Adams Gen. Recent Moll. II [1858], p. 599.

Aplydium Woodward Man. Moll. [pt. 3 (1856),] p. 342.

Colony sessile, polymorphous, composed of numerous annular, sub-elliptical, or irregular systems, without common orifices. *Individuals* [only slightly elongated,] placed in a single row at equal distances from the common axis. *Branchial aperture* 6-lobed; atrial [with or] without lobes. *Branchial sac* with papillæ. *Abdomen* inferior, sessile. *Post-abdomen* [short and thick or] linear and more or less elongated.

a. Post-abdomen short.

1. **Aplidium ficus** (Pallas) Savigny.

(Figs. 97–99.)

Alcyonium pulmonis instar lobatum Ellis Nat. Hist. Corall. [1755], p. 82, pl. xvii, f. *b*, B, C, D.; [(French transl.) Hist. nat. Corall. (1756), p. 97, pl. xvii, f. *b*, B. C. D; and (German transl.) Naturgesch. Corall. (1764), p. 89, pl. xvii, f. b, 3].

Alcyonium ficus [Pallas Elench. Zooph. (1766), p. 356;] Linnæus Syst. Nat. ed. 12, [I, pt. 2 (1767),] p. 1295; [Boddaert Lyst Plant-Dieren (1768), pp. 442, 653, pl. xi, f. 3; Berkenhout Nat. Hist. Gr. Brit. Irel. I (1769), p. 210; *op. cit.* ed. 2, I (1789), p. 213; and ed. 3, I (1795), p. 213; Houttuyn Nat. Hist. Dieren, I, 17 stuk (1772), pp. 412, 606; P. Müller Linné Natursyst. VI, 2 (1775), p. 787; Wilkens Charakt. Thierpfl. II (1787), p. 191, pl. xviii, f. 63; Bruguière Hist. nat. Vers, I (1789), p. 26, in Encycl. Méth.; Gmelin Linnæi Syst. Nat. ed. 13, I, pt. 6 (1791), p. 3813; Olivi Zool. Adriatica (1792), p. 240; Esper Pflanzenthiere, III (1794), p. 63, pl. xx, ff. 1–7; Cuvier Tabl. elém. (1798), p. 682; Bosc Hist. nat. Vers, III (1802), p. 133, and ed. 2, III (1827), p. 160; Turton Gen. Syst. Nat. (1806), IV, p. 653; Oken Lehrb. Naturgesch. III, 1 (1815), p. 81; *non* Lamouroux Polyp. Corall. flex. (1816), p. 346, and (Engl. transl.) Corallina (1824), p. 249.

Alcyonium pulmonaria Solander Nat. Hist. Zooph. [1786], p. 175; [Lamarck in Mém. du Mus. I (1815), p. 76; Lamouroux Polyp. Corall. flex. (1816), p. 342, and (Engl. transl.) Corallina (1824), p. 249].

[*Alcyonium ficas* Turton Brit. Fauna, I (1807), p. 207.]

Aplidium ficus Savigny Mém. Anim. sans Vert. pt. 2 [1816], p. 183; [Lamouroux Exp. méth. Polyp. (1821), p. 74;] Fleming Hist. Brit. Anim. [1828], p. 470; Oken Allgem. Naturgesch. V, 1 (1835), pp, 92, 93; Forbes & Hanley Brit. Moll. I [1848], p. 11; [Alder & Hancock (?) in Trans. Tyneside Nat. Field Club, I (1848), p. 203; Cocks in Rep. R. Cornw. Polyt. Soc. for 1849 (1850), p. 73; Hoeven Handb. Zool. (Engl. transl.) I (1856), p. 703; Ansted & Latham Channel Isl. (1862), p. 219; Grube Insel Lussin Meeresf. (1864), p. 58].

[*Aplidium sublobatum* Lamarck Hist. nat. Anim. s. Vert. III (1816), p. 95, and ed. 2, III (1840), p. 498.]

[*Polyclinum ficus* Cuvier Règne Anim. (1817), II, p. 501; ed. 2, III (1830), p. 169; and ed. 3 (1836), II, p. 105; McMurtrie (Engl. transl.) Cuvier's Anim. Kingd. III (1834), p. 115; Deshayes in Cuvier's Règne Anim., Moll. (*cir.* 1845), p. 245.]

[*Alpidium ficus* Fleming in Edinb. Encycl. XIV (1821), p. 631; Philos. Zool. (1822), II, p. 514; and Moll. Anim. (1837), p. 213.]

[*Synoicum ficus* Blainville Man. Malac. et Conch. (1825), p. 587; (1827), pl. lxxxii, ff. 6, 6 *a*, 6 *b*; Rang Hist. nat. Moll. (1829), p. 355; McMurtrie (Engl. transl.) Cuvier's Anim. Kingd., Atlas, III (1837), pl. xliii ter, ff. 5, 5 *a*, 5 *b*.]

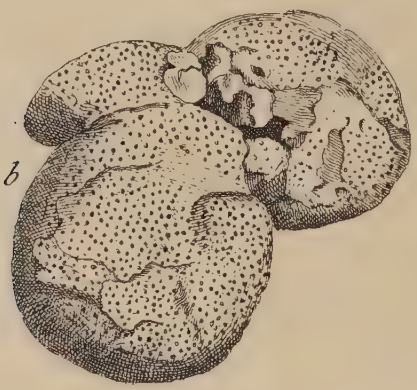

Fig. 97.—*Aplidium ficus*. A colony, natural size. (After Ellis, *loc. cit.*)

Colony forming a sub-orbicular, or lobed and depressed, fleshy mass, of a dull yellow colour when fresh, changing to a dark olive in spirit. *Individuals* yellowish. *Branchial sac* with six or seven rows of areolar stigmata. *Post-abdomen* rather short and stout.

Diameter of mass from two to four and a half inches (50–114 mm.).

Hab.—[In trawl refuse (*Cocks*).]

England.—Whitstable, Kent (*Ellis; Alder & Hancock*). [Bream Bay sands and Helford River, Falmouth, Cornwall (*Cocks*).]

First record.—Ellis, 1755.

A specimen was procured by Ellis from the fishermen at Whitstable, from which place we have also received one from a friend. Ours is strongly lobed, and measures four and a half inches across.

[Ellis says that the species "borrows the name of the sea-fig among the fishermen," because "the inside is full of little oblong yellow particles." It is, however, very varied in external form, sometimes greatly resembling a fig, a name which would scarcely have been so generally applied to it from its appearance when cut open. Besides being the "Sea-fig" of England, it is the "Figue de mer" of France, the "Fico di mare" of

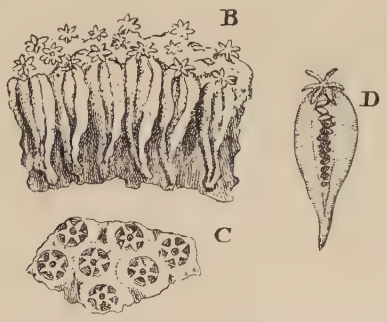

Fig. 98.—*Aplidium ficus*. Magnified. (After Ellis, *loc. cit.*) B, section through part of the colony; C, face view of part of the colony; D, a single individual.

Italy, the "Higo de mer" of Spain, the "Figo de mer" of Portugal, the "Seefeige" of Germany, the "Zeevyg" of Holland, the "Söefigenet" of Denmark, and the "Sjöfikon" of Sweden.

The following references by earlier naturalists than John Ellis probably pertain to *Aplidium ficus*:—

Halcyonium quintum. Dioscorides: 'Medica materia' (1478), lib. V, cap. 90.

Pulmo marinus alter. Rondelet: 'Insectis et Zoophytis' (1555), p. 132.

Alcyonium tuberosum in formâ di fico, frutto. Imperati: 'Hist. Nat.' (1599), p. 637, fig. p. 641.

Alcyonium tuberosum. Bauhin: 'Hist. plant. univ.' (1651), III, p. 817, fig.

Alcyonium tuberosum in forma di fico frutto. Bonanni: 'Museo Kirsch.' (1709), pp. 178, 179.

Pulmo marinus alter Rondeletii. Ray: 'Synops. meth. Avium et Piscium' (1713), p. 31.

Alcyonium quintum antiquorum. Mercati: 'Metalotheca Vatic.' (1715), cap. vi.

The "Figue de substance d'Eponge et d'Alcion" of Marsigli ('Hist. Phys. de la Mer,' 1725, p. 87, pl. xvi, fig. 79), which is sometimes referred to this species, is most probably a sponge.

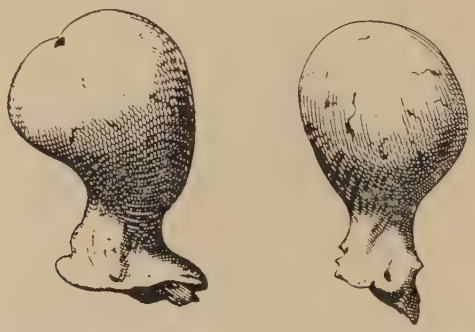

Fig. 99.—? *Aplidium ficus.* Two colonies, one half natural size. (After Mercati, *loc. cit.*)

The figures here given from Mercati (fig. 99) are very fig-like, but much reliance should not be placed upon them as truly representing the species.

2. **Aplidium melleum** *sp. nov.*

(Plate LV, figs. 1 and 2, and Pl. LVI, fig. 6.)

Colony conical or sub-triangular, small, honey-yellow coloured, transparent, attached to the stems of sea-weeds either by the side or by a narrow base (Pl. LV, figs. 1 and 2). *Individuals* rather darker coloured than the envelope, yellow or orange, arranged irregularly through the mass. *Branchial aperture* 6-lobed. *Stomach* longitudinally plicated; *intestine* not twisted. *Post-abdomen* very short.

Diameter of mass from a quarter to half an inch (6—12 mm.).

Hab.—On sea-weed, between tide-marks.

Channel Islands.—Parella Bay, Guernsey (*Norman*).
First record.—Alder & Hancock; *coll.* Norman [1865].

This beautiful little *Aplidium* was found studding the slender fronds of a sea-weed, in yellow drop-like masses, in great abundance by the Rev. A. M. Norman. The masses are generally detached, but occasionally two are united by a creeping fibre.

b. Post-abdomen elongated.

3. **Aplidium glomeratum** *sp. nov.*

(Plate LV, figs. 3–6; and Pl. LVI, fig. 7.)

Colony ovate, convex, composed of unequal-sized clusters united into a common mass below (Pl. LV, fig. 6); semi-transparent, yellowish-green, attached by a broad base. *Individuals* (Pl. LVI, fig. 7) yellowish-fawn-coloured, generally from two to six placed irregularly in each cluster. *Post-abdomen* rather long.

Size of mass three-quarters of an inch long by half an inch wide (19 by 12 mm.).

Hab.—Between tide-marks.

Channel Islands.—Gouliot Caves, Sark (*Norman*).
First record.—Alder & Hancock; *coll.* Norman [1865].

A single individual of this curious species was obtained by Mr. Norman among the numerous ascidians, zoophytes, and sponges which cover the walls of the Gouliot Caves in Sark.

4. **Aplidium nutans** Johnston.

(Plate LV, figs. 7–9 (?); and fig. 100 in text.)

Aplidium nutans Johnston in Loud. Mag. Nat. Hist. VII [1834], p. 16, f. 5; Forbes & Hanley Brit. Moll. I [1848], p. 12; [Cocks in Rep. R. Cornw. Polyt. Soc. for 1849 (1850), p. 73; Ansted & Latham Channel Isl. (1862), p. 219].

Colony knob-like or pear-shaped, smooth, gelatinous, pellucid, of a straw-yellow colour tinted with brown and marked with whitish streaks from the immersed animals; adherent by a broad base (fig. 100, A). *Indi-*

Fig. 100.—*Aplidium nutans.* (After Johnston, *loc. cit.*) A, a group, natural size. B, a single individual, × about 20. *a*, branchial aperture; *b*, branchial sac; *c*, atrial aperture; *d*, stomach (?).

viduals irregularly scattered, and lying horizontally or nearly so, with a short, bulging thorax, [a very short abdomen,] and a long, linear post-abdomen (fig. 100, B). *Stomach* orange-coloured, marked with longitudinal lines.

General mass about an inch (25 mm.) high and half an inch (12 mm.) in diameter; individuals four lines (8 mm.) long.

Hab.—Deep water. [Attached to under surface of stones, sides of rocks, etc. (*Cocks*).]

England.—[? Cullercoats, Northumb. (*Alder*). Falmouth, Cornwall (*Cocks*).]

Scotland.—Berwick Bay, Berwickshire (*Johnston*).

First record.—Johnston, 1834.

The individuals of this species are stated by Dr. Johnston to be "nutant" or curved downward at the top. This is probably only the case when the animals are dead and contracted, as the apertures would no doubt rise to the surface in a living state. Dr. Johnston's figure of an individual agrees very well with Savigny's second tribe of *Aplidia*: "Animaux filiformes, à *ovaire* beaucoup plus long que le corps." We have not been so fortunate as to meet with either this species or *Amaroucium fallax* Johnst.; our knowledge of them therefore entirely depends upon Dr. Johnston's descriptions and figures.*

Genus 18. **SIDNYUM** Savigny, 1816.

Sidnyum Savigny Mém. Anim. sans Vert. pt. 2 [1816], p. 238.

Colony turbinated, rounded above and contracted below, sessile; composed of several systems. *Individuals* elongated; *branchial aperture* 6-lobed; *atrial* simple, tubular, applied against the thorax. *Thorax* and *abdomen* of nearly equal length, rather short. *Post-abdomen* pedunculated, slender, dilated, and filiform.

By the above characters M. Savigny distinguishes a genus founded upon a Compound Ascidian sent to him from England by Dr. Leach. He considers it to be

* [The figures (Pl. LV, figs. 7–9) doubtfully referred to *Aplidium nutans* were drawn by Alder from specimens found at Cullercoats. Under the drawings, in his writing, is "*Aplidium nutans*, Johns. ?"]

intermediate between *Synoicum* and *Aplidium*, and only to be distinguished from the latter by the structure of the stomach; the very slender and pedunculated form of the ovary (post-abdomen)* giving it at the same time some resemblance to *Sigillina*.

The genus ought probably to be united to *Aplidium*.

1. **Sidnyum turbinatum** Savigny.

Sidnyum turbinatum Savigny Mém. Anim. sans Vert. pt. 2 [1816], p. 239.

Colony perfectly transparent [lobed, each lobe corresponding to a system]. *Individuals* arranged in long, narrow ellipses directed from the centre towards the circumference. (Other characters as in the genus of which this is the only species.)

Dr. Fleming found what he was inclined to consider *S. turbinatum* on the rocks of the Isle of May, and his description of it in 'British Animals' is compounded of the characters of Savigny's genus and of those of his own recent specimen. Professor Edward Forbes, again, has adopted what we believe to be another species as the *Sidnyum turbinatum* of Savigny, and has altered the generic character to suit it.† It is only necessary, however, to pay a little attention to Savigny's description to be convinced that our distinguished English naturalist was under a mistake, and that his species, an individual of which he figures with a branchial aperture of eight lobes, and a broad, unpedunculated post-abdomen (see 'Brit Moll.' Pl. B, f. 2), cannot be the animal described by Savigny with a branchial aperture of six lobes, and a pedunculated post-abdomen dilated and filiform (*mince comme un fil*). Besides which Forbes' species has a single circular

* Savigny had not detected in these animals the character of the circulation and position of the heart, which is situated along with the ovary in "the post-abdomen" of Milne Edwards.

† [These species are here described under the names of *Parascidia Flemingii* and *P. Forbesii* (pp. 19 and 20).]

system with a common excretory orifice in the centre (mentioned only as a depression in the description), while Savigny's has several systems radiating in narrow ellipses from the centre to the circumference like the plates of a single-starred Madrepore, and without a common orifice.

If this view be correct the *Sidnyum turbinatum* of Savigny remains yet to be identified. Mr. Thompson gives two localities for it in Ireland,* but we believe his species to be that of Forbes, with whom he was in constant correspondence.

Family 6. Didemnidæ.

Individuals not much elongated, composed of a distinct thorax and abdomen, and enveloped in a common mass, but without post-abdomen, the heart and ovaries being associated with the digestive organs in the abdomen.

[This family has been divided into two: Distomidæ, containing the genus *Distoma*; and Didemnidæ, containing the genera *Didemnum* and *Leptoclinum*; both families also having genera not represented in the British Isles. They chiefly differ in the Distomidæ having a colony "rounded and massive, rarely incrusting, either sessile or supported upon a long or short peduncle;" and the Didemnidæ having a colony "usually flat, thin, and incrusting, rarely thick and massive, never pedunculated." (*Herdman.*)]

* [Strangford Lough and Belfast Bay, the former on his own authority, the latter on that of Dr. Drummond.]

Section 1. Without common excretory orifices.

A. Branchial aperture only with lobes.

Genus 19. **DIDEMNUM** Savigny.

Didemnum Savigny Mém. Anim. sans Vert. pt. 2 (1816), p. 194; [Lamouroux Exp. méth. Polyp. (1821), p. 75;] Milne Edwards Obs. Ascidies comp. [1841], p. 79, [in Mém. Acad. Sci. Inst. France, XVIII (1842), p. 295].
*Didemnium** Woodward Man. Moll. [pt. 3 (1856)], p. 341; [H. & A. Adams Gen. Recent Moll. II (1858), p. 602].

Colony sessile, gelatinous or cartilaginous, [sometimes thin] and incrusting. *Individuals* dispersed irregularly over the surface, or very indistinctly combined into systems, without a common excretory orifice. *Branchial aperture* with six lobes, atrial plain, indistinct. [*Tentacles* eight in number.] *Thorax* short, sub-globular; *abdomen* larger than the thorax and united to it by a peduncle more or less distinct. *Ovary* single, placed at the side of the abdominal cavity.

1. **Didemnum gelatinosum** Milne Edwards.

(Figs. 101–103.)

Didemnum gelatinosum Milne Edwards Obs. Ascidies comp. [1841], p. 79, [in Mém. Acad. Sci. Inst. France, XVIII (1842), p. 295,] pl. vii, ff. 5, 5 *a–d*; [Deshayes in Cuvier's Règne Anim., Moll. (*cir.* 1845), pl. cxxix, f. 4; Thompson in Ann. Nat. Hist. (2) I (1848), p. 64; Victor Carus in Proc. Ashmol. Soc. II (1851), p. 268; M. Sars in Nyt Mag. f. Naturvid. VI (1851), p. 153;] Thompson [in Rep. Brit. Assoc. for 1852 (1853), p. 293, and] Nat. Hist. Ireland, IV [1856], p. 364; [Woodward Man. Moll. pt. 3 (1856), p. 341, pl. xxiv, f. 10;] M. Sars in Förhandl. Vid.-Selsk. Christ. 1858 [1859], p. 66; [Gegenbaur in Arch. f. Anat. 1862, p. 149, pl. iv; Alder in Rep. Brit. Assoc. for 1866 (1867) p. 208; Grube in Abh. schles.

* So spelt in the authors' MS. and by several others, but this variation in spelling is not here discriminated in the synonymy of the various species.

Ges. vaterl. Cultur, 1868–69 (1869), pp. 105, 125; Norman in Rep. Brit. Assoc. for 1868 (1869), p. 303; Gavin in Zeits. f. wiss. Zool. XX, 4 (1870), pp. 512, 515].

Colony (fig. 101) incrusting, thin, viscous, and without colour. *Individuals* small, yellow, disposed without appreciable order through the mass. *Branchial*

Fig. 101.—*Didemnum gelatinosum*, fixed on a mass of *Serpulæ*. Natural size. (M. Edwards, pl. vii, f. 5.)

aperture with six small obtuse lobes. *Thorax* large,* the branchiæ with five rows of stigmata. *Abdomen* united to the thorax by a well-marked peduncle. Reproductive buds branching from the abdomen and running through the tegumentary mass (fig. 103).

Fig. 102.—Development of *Didemnum gelatinosum*. Highly magnified. *a*, early stage; *b*, later stage.

Diameter of mass one or two inches (12–25 mm.). *Length* of individuals half a line (1 mm.).

Hab.—Adherent to *Serpula tubularia*, etc. (*Thompson*).

* The word in the MS. is "small," but this is evidently an error. Milne Edwards says "thorax gros."

England. — Seaham Harbour, Durham (*Hodge*). Scilly Isles (*Carus*).

Wales.—Menai Straits, Anglesey (*Bowerbank*).

Ireland.—Strangford Loch, Down, dredged [1839] (*Thompson*). "Dr. Scouler has met with it on the Irish Coast" (*Thompson*, 'Nat. Hist. Irel.').

Channel Islands.—Guernsey, and Gouliot Caves, Sark (*Norman*).

First record.—Thompson, 1848.

M. Sars records this species as common on the Norwegian Coast.

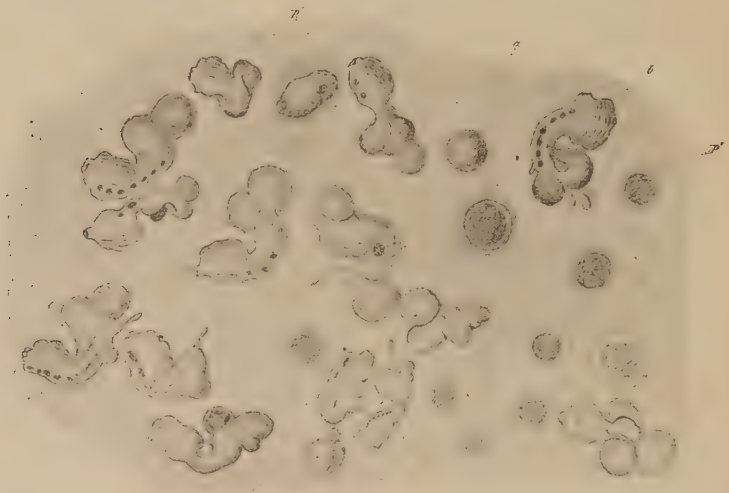

Fig. 103.—Part of a colony of *Didemnum gelatinosum*, enlarged. *a*, common tegumentary tissue; *b*, an individual immersed in the tissue; *p'*, an egg only a little developed; *p''*, an egg more developed. (M. Edwards, pl. vii, f. 5*a*.)

The following are notices of other species of *Didemnum*:—

Mr. William Thompson ('Nat. Hist. Ireland') says: "A species apparently of this genus may not uncommonly be found investing the stems of *Halidrys siliquosa*. It is of a pale-gray colour, and may be said to give the plant the appearance of being besmeared with bird-lime."

[Canon A. M. Norman found a species in Parella Bay, Guernsey, in 1865, which, judging from the figure of it given by Alder (Pl. LV, fig. 10), may be the same as the above; and another form which he procured there at the same time (Pl. LV, fig. 12) is probably a variety.]

Dr. Victor Carus ('Proc. Ashm. Soc.' II, p. 267) also announces the occurrence of *Didemnum candidum* Sav. in the Scilly Islands, but as this is a Red Sea species there may possibly be some mistake in its identity.

[2. **Didemnum candidum** Savigny.]

(Figs. 104 and 105.)

[*Didemnum candidum* Savigny Mém. Anim. sans Vert. pt. 2 (1816), pp. 14, 194, pl. iv, f. 3, and pl. xx, f. 1; Lamouroux Exp. méth. Polyp. (1821), p. 75, pl. lxxvii, f. 7; Fleming Philos. Zool. (1822), II, p. 515; Eichwald Zool. Spec. I (1829), p. 268; Fleming Moll. Anim. (1837), p. 213; Delle Chiaje Descriz. Anim. Invert. III (1841), p. 21, pl. lxxxv, f. 26; Deshayes in Cuvier's Règne Anim., Moll. (*cir.* 1845), pl. cxxix, f. 3; Löwig & Kölliker in Ann. Sci. Nat. (3), Zool. V (1846), p. 208, pl. vi, ff. 26, 27, and in Arch. Sci. Nat. III (1846), p. 297; Rupert Jones in Cyclop. Anat. IV, pt. 40 (1850), p. 1196, f. 774 *a*; Victor Carus in Proc. Ashmol. Soc. II (1851), p. 268; Schacht in Archiv f. Anat. 1851, p. 192, and in Quart. Journ. Micr. Sci. I (1853), p. 107; Hoeven Handb. Zool. (Engl. transl.) I (1856), p. 703; H. & A. Adams Gen. Recent Moll. II (1858), pl. cxxxv, ff. 3, 3 *a*; Owen Moll. in Encycl. Brit. ed. 8, XV (1858), p. 332; Bronn Thier-Reichs, III (1861), pp. 115, 117, pl. xii, f. 10.

Didermum candidum Delle Chiaje Mem. Anim. senza Vert. III (1828), p. 97, pl. xxxvi, f. 26.

Eucalium candidum Lamarck Hist. nat. Anim. s. Vert. ed. 2, III (1840), p. 493.]

[*Colony* (fig. 104) incrusting, thin, opaque, and milk-white in colour, flat or relieved here and there with a few protuberances. *Individuals* (fig. 105) small, disposed in fairly regular order throughout the mass, their tunic membranous, marked with slender muscular

nerves. *Branchial aperture* with six sharply-pointed lobes. *Thorax* and *abdomen* saffron-yellow in colour, united by a peduncle a little longer than the thorax. *Stomach* nearly globular, very simple, the intestine with two slight constrictions below the stomach before its upward, ventral bend.

Diameter of mass one inch to two inches (25 to 50 mm.). *Length* of individuals half a line (1 mm.).

Hab.—Investing Madrepores.

England.—Scilly Islands (*Carus*).

First record.—Carus, 1850.

This species is admitted on the authority of Victor Carus as the fact of its having been found in the Gulf of Suez does not seem a sufficient reason for doubting its occurrence in British waters.

Fig. 104.—*Didemnum candidum.* Natural size. (Savigny, pl. iv, f. 3.)

Savigny describes it as being opaque, fungous, or spongeous, spreading over and more or less enveloping the stems of madrepores in milk-white incrustations, its surface covered with prominent nipples arranged in six rays and disposed nearly in quincunx. The individuals, or polypes as he calls them, are, he says, yellow and very small, scarcely equalling in volume two poppy seeds, one for the thorax, the other for the abdomen and ovary together. The branchial aperture resembles a funnel with its limb or upper margin cut out into six very simple teeth, which are expanded and pointed. The thorax is short, rounded, and furrowed transversely, the back very gibbous and divided by a longitudinal depression, the front hollowed out below the tubercle. The abdomen is larger than the thorax and nearly horizontal in

position, that is at right angles with the thorax and connecting peduncle, and its form is elliptic. The ovary is orbicular and lies on the left side of the abdomen.]

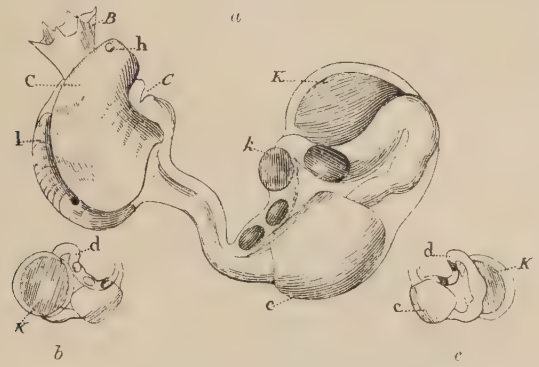

Fig. 105.—Individuals of *Didemnum candidum*. Enlarged. (Savigny,* pl. xx, ff. 1^{2} *.) *a*. Details of an individual seen from the right side, much enlarged. *b*. Another individual deprived of its thorax and less enlarged than the preceding; its intestine and ovary differently disposed. Seen from the left side. *c*. The same reversed. *B*, branchial aperture; C, mantle; *C*, atrial aperture; c, stomach; d, intestine; h, anterior (branchial) tubercle; *K*, ovary; *k*, excrement contained in the intestine; l, dorsal lamina.

B. Both apertures lobed.

Genus 20. **DISTOMA** Savigny, 1816.

(Distomus Gaertner, 1774.)

Distomus Gaertner in Pallas' [Spicil. Zool. I, fasc. 10 (1774), p. 35; Lamarck Hist. nat. Anim. s. Vert. III (1816), p. 100, and ed. 2, III (1840), p. 497; Woodward Man. Moll. pt. 3 (1856), p. 342;] H. & A. Adams Gen. Recent Moll. II [1858], p. 603.

Distoma Savigny Mém. Anim. sans Vert. pt. 2 [1816], p. 176; [Lamouroux Exp. méth. Polyp. (1821), p. 72;] Forbes & Hanley Brit. Moll. I [1848], p. 18.

Diazona Fleming Brit. Anim. [1828], p. 469.

Distomum M. Sars [in Nyt Mag. f. Naturvid. VI (1851), p. 154].

* All the figures after Savigny are copied from his 'Mémoires,' pt. 2 (1816).

Colony polymorphous, semi-cartilaginous [or gelatinous], sessile. *Individuals* immersed, irregularly arranged into several subcircular [or elongate] systems without common excretory orifices. *Thoraæ* and *abdomen* rather distant, united by a peduncle. *Apertures* terminal, both with six lobes. *Branchial sac* with papillæ.

The individuals of this genus greatly resemble those of *Diazona* in form, but differ in being wholly immersed in the common mass, which is generally depressed or incrusting.

1. **Distoma rubrum** Savigny.

(Figs. 106 and 107.)

Distoma rubrum Savigny [in Descr. Égypte, Hist. Nat. I (dated 1809, but later), pt. 2, p. 24, and] Mém. Anim. sans Vert. pt. 2 [(1816), pp. 38, 177], pl. iii, f. 1, and pl. xiii; [Lamouroux Exp. méth. Polyp. (1821), p. 72, pl. lxxvii, f. 1; Thompson in Ann. Nat. Hist. (1) V (1840), p. 95, and in Rep. Brit. Assoc. for 1843 (1844), p. 264;] Forbes & Hanley Brit. Moll. I [1848], p. 18, pl. A, f. 6, and pl. B, f. 6; [Cocks in Rep. R. Cornw. Polyt. Soc. for 1849 (1850), p. 74; Gosse Man. Marine Zool. II (1856), p. 33, f. 48;] Thompson Nat. Hist. Ireland, IV [(1856), p. 361; Merrifield Nat. Hist. Brighton (1860), p. 81; Norman in Zoologist, XVIII (1860), p. 7247].

[*Polyzona rubra* Fleming Philos. Zool. II (1822), p. 513, and Moll. Anim. (1837), p. 211.]

[*Distoma rubra* Risso Hist. nat. Europe mérid. (1826), IV, p. 278; Ansted & Latham Channel Isl. (1862), p. 219.]

[*Synoicum rubrum* Coldstream in Edinb. new Philos. Journ. IX (1830), p. 239, pl. ii, ff. 8–11.]

[*Distomus ruber* Oken Allgem. Naturgesch. V, 1 (1835), p. 94; Lamarck Hist. nat. Anim. s. Vert. ed. 2, III (1840), p. 498; H. & A. Adams Gen. Recent Moll. II (1858), pl. cxxxv, ff. 4, 4 *a*.]

Colony (fig. 106) an erect, compressed mass of a reddish-violet colour. *Individuals* (fig. 107) slightly prominent, yellowish, scattered over the two sides in groups of from three to twelve in each system. *Apertures* a little apart, 6-lobed, tinted with purple.

Diameter of the general mass four or five inches (101–127 mm.); *thickness* half an inch (12 mm.); *length* of individuals two lines (4 mm.).

Hab.—On *Laminaria digitata*. [On stones and on stems of *Laminaria digitata*, in pools at low water-mark (*Cocks*).]

England.—[Brighton (*Merrifield*). Gwyllyn-vase, Swanpool, and Pennance, Falmouth, Cornwall (*Cocks*).]

Scotland.—[North shore of Lamlash Bay, Arran (*Coldstream*).]

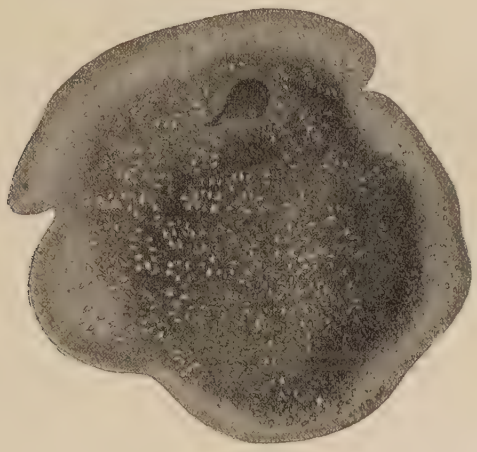

Fig. 106.—*Distoma rubrum*. One half natural size. (Savigny, pl. iii, f. 1.)

Ireland.—Belfast Bay, Antrim, dredged by E. Getty (*Thompson*).

First record.—Thompson, 1840; *coll.* Getty.

Savigny gives "les mers d'Europe" as the habitat of this species, it is presumed on the authority of Dr. Leach from whom he received the specimen. Mr. Thompson states that his specimens were not of so lively a colour as represented in Savigny's work. No specimens, however, are preserved in his collection.

[This is probably the "*Alcyonium rubrum, pulposum, conicum plerumque*" of Plancus (Bianchi) in 'Conch. minus notis,' ed. 2 (1760), App., p. 113, pl. x.]

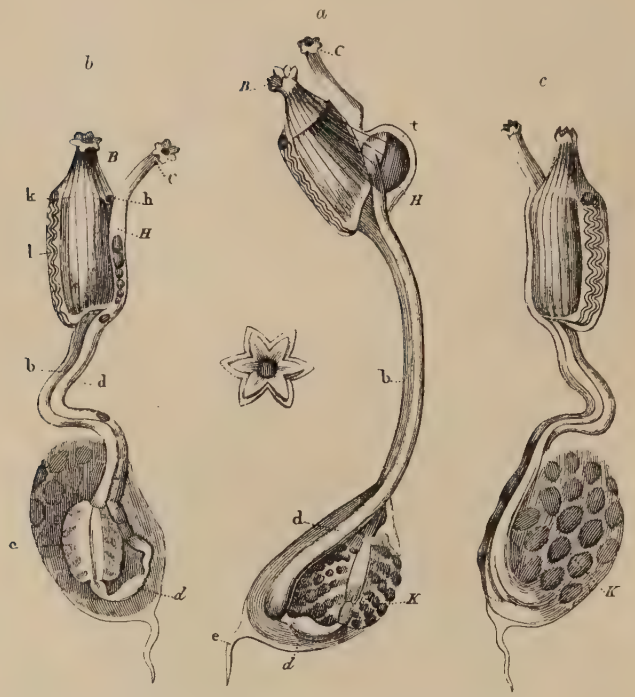

FIG. 107.—Individuals of *Distoma rubrum*. Much enlarged. (Savigny, pl. xiii, ff. 1 [4, 8, 9].) *a*. An individual seen from the right side; with branchial aperture further enlarged. *b*. Another individual differing in the forward bend of the intestine and the curvature of the peduncle of the abdomen. *c*. The same reversed. *B*, branchial aperture; b, œsophagus; *C*, atrial aperture; c, cæcum of the stomach; d, intestine; *d*, swelling of the intestine near the pylorus; e, prolongation of the mantle in the base of the test, or in its peduncle; *H*, anal aperture; h, anterior (branchial) tubercle; *K*, ovary; k, posterior tubercle; l, dorsal lamina; t, an isolated germ being protruded from the anal aperture.

[2. **Distoma variolosum** (Gaertner) Savigny.]

(Plate XLVI, figs. 12–14, and fig. 108 in text.)

[*Distomus variolosus* GAERTNER in Pallas' Spicil. Zool. I, fasc. 10 (1774), pp. 35, 40, pl. iv, ff. 7, 7 *a*; OLIVI in Opusc. scelti Scienze, XVI (1793), p. 248; SAVIGNY Mém. Anim. sans Vert. pt. 2 (1816), p. 38; LAMARCK Hist. nat. Anim s. Vert. III (1816), p. 101, and ed. 2, III (1840), p. 498; DELLE CHIAJE Mem. Anim. senza Vert. III (1828), pp. 86, 94; STARK Elem. Nat. Hist. (1828), II, p. 120.

Alcyonium ascidioides Pallas Spicil. Zool. I, fasc. 10 (1774), pp. 35, 40; Gmelin Linnæi Syst. Nat. ed. 13, I, pt. 6 (1791), p. 3816; Olivi Zool. Adriatica (1792), p. 236; Turton Gen. Syst. Nat. IV (1806), p. 656, and Brit. Fauna, I (1807), p. 207; Savigny Mém. Anim. sans Vert. pt. 2 (1816), pp. 3, 26.

Alcyonium distomum Bruguière Hist. nat. Vers, I (1789), p. 23, in Encycl. Méth.; Bosc Hist. nat. Vers (1802), III, p. 132, and ed. 2 (1827), III, p. 159; Lamouroux Hist. Polyp. Corall. flex. (1816), p. 352, and (Engl. transl.) Corallina (1824), p. 250.

Distoma variolosum Savigny Mém. Anim. sans Vert. pt. 2 (1816), pp. 38, 178; Lamouroux Exp. méth. Polyp. (1821), p. 73; Thompson in Ann. Nat. Hist. (1) V (1840), p. 95; Delle Chiaje Descriz. Anim. Invert. III (1841), p. 21, pl. lxxx, f. 12; Thompson in Rep. Brit. Assoc. for 1843 (1844), p. 264; Forbes & Hanley Brit. Moll. I (1848), p. 19; Cocks in Rep. R. Cornw. Polyt. Soc. for 1849 (1850), p. 74; Norman in Zoologist, XV (1857), p. 5707.

Distoma variolosus Oken Lehrb. Naturgesch. III, 1 (1815), p. 83; Fleming in Edinb. Encycl. XIV (1820), p. 631; Rang Hist. nat. Moll. (1829), p. 353.

Polyclinum variolosum Cuvier Règne Anim. (1817), II, p. 501, and ed. 2, III (1830), p. 169; McMurtrie (Engl. transl.) Cuvier's Anim. Kingd. III (1834), p. 115.

Polyzona variolosa Fleming Philos. Zool. (1822), II, p. 513, and Brit. Anim. (1828), p. 469.

Distoma variolatus Blainville Man. Malac. et Conch. (1825), p. 585, and (1827), pl. lxxxii, ff. 4, 4*a*; McMurtrie Cuvier's Anim. Kingd. (Engl. transl.), Atlas, III (1837), pl. xliii ter, f. 3.

Distomus ascidioides Oken Allgem. Naturgesch. V, 1 (1835), pp. 93, 94.

Polyzona variolosum Fleming Moll. Anim. (1837), p. 211.

Polyclinum variolosus Deshayes in Cuvier's Règne Anim., Moll. (*cir.* 1845), p. 245.

Distomum variolosus Hoeven Handb. Zool. (Engl. tranl.) I (1856), p. 704.

Thylacium variegatum Alder in Ann. Nat. Hist. (3) XI (1863), p. 168.

Didemnium variolosum Grube Insel Lussin Meercsf (1864), p. 62, pl., f. 4.]

[Colony (Pl. XLVI, figs. 12, 13; and fig. 108, *a*, in text) "coriaceous, not thick, flat beneath, warty above;

pale reddish or yellowish white. Individuals (fig. 108, *b*) orange red. Systems not distinctly circumscribed." (*Forbes & Hanley.*) "Individuals for the most part oval, varying from saffron to red in colour, each being doubly perforated with small crimson orifices having somewhat swollen margins similarly coloured and with six distinct radii forming as it were so many teeth around them." (*Gaertner*, transl.)

Diameter of the mass from one-half to three-quarters of an inch (12–18 mm.).

Hab.—On *Fucus palmatus* (*Gaertner*). Investing *Fucus serratus* (*Thompson*). On roots of *Laminaria digitata* (*Cocks*). On the test of *Cynthia mamillaris* (*Jeffreys*). On the carapace of *Maia squinada* (*Norman*).

Fig. 108.—*Distoma variolosum.* (After Gaertner, *loc. cit.*) *a*, a colony, natural size; *b*, a single individual, enlarged.

England.—Lulworth Cove, Dorset (*Jeffreys*). Coast of Cornwall (Gaertner). Falmouth, Cornwall (*Cocks*).

Scotland.—Firth of Clyde (*Norman*).

Ireland.—Belfast Bay, Antrim (*Thompson*).

Channel Islands.—Guernsey (*Norman*).

First record.—Gaertner, 1774.

This species was described in Vol. II of the present monograph (p. 138) as a *Thylacium*. It is however the type species of the genus *Distoma* and could not be removed to a genus more recently founded and differing moreover in having the apertures 4-lobed.]

3. **Distoma vitreum** M. Sars.

(Plate LV, fig. 13, and Pl. LVI, fig. 8.)

Distoma vitreum M. Sars in Nyt Mag. f. Naturvid. VI [1851], p. 154, [and in Förh. Vid-Selsk. Christ. 1858 (1859), p. 66; Ansted & Latham Channel Isl. (1862), p. 219].

Colony greyish white, hyaline, sub-cartilaginous, clavate or fusiform, adhering by a narrow base. *Individuals* white or yellowish, irregularly disposed (Pl. LV, fig. 13). *Branchial* and *atrial apertures* each with six blunt lobes. *Abdomen* oblong-ovate, united to the thorax by a thickish peduncle.

Length of mass a quarter to half an inch (6–12 mm.).

Hab.—Adhering to the stem of a zoophyte.

Channel Islands.—Dredged (*Norman*).

First record.—Alder & Hancock; *coll.* Norman.

A cluster of specimens of different sizes (mostly young) was dredged by Mr. Norman.

Section 2. With common excretory orifices.

Genus 21. **LEPTOCLINUM** Milne Edwards, 1841.

Leptoclinum Milne Edwards Obs. Ascidies comp. [(1841), p. 81, in Mém. Acad. Sci. Inst. France, XVIII (1842), p. 297;] Forbes & Hanley Brit. Moll. I [1848], p. 341; Gosse Man. Marine Zool. II [1856], p. 33; Woodward Man. Moll. pt. 3 (1856), p. 341; H. & A. Adams Gen. Recent Moll. II [1858], p. 604.

Colony incrusting, thin, coriaceous or gelatinous, [polymorphous,] often containing calcareous crystals. *Individuals* small, set in [many] very indistinct systems, each with a common cloaca and excretory orifice. *Branchial aperture* with six rays; *atrial* plain [but with a long languet]. *Abdomen* united to the thorax by a short peduncle or sometimes nearly sessile.

a. With calcareous crystals.

1. **Leptoclinum maculosum** Milne Edwards.

(Plate LVII.)

Leptoclinum maculosum Milne Edwards Obs. Ascidies comp. [1841], p. 81, [in Mém. Acad. Sci. Inst. France, XVIII (1842), p. 297,] pl. viii, f. 2; [Thompson in Rep. Brit. Assoc. for 1843 (1844), p. 264, and in Ann. Nat. Hist. (1) XIII (1844), p. 434;] Forbes & Hanley Brit. Moll. I [1848], p. 16; Thompson Nat. Hist. Ireland, IV [1856], p. 362; [Woodward Man. Moll. pt. 3 (1856), p. 342; Norman in Zoologist, XVIII (1860), p. 7247; Ansted & Latham Channel Isl. (1862), p. 219].

Colony forming a thin, tough, leathery crust, sometimes slightly papillose, of a white or greyish colour [occasionally with a blue or purplish tinge], marked with undulating or branching purplish lines (Pl. LVII, figs. 2, 5, and 7); the surface densely crowded with stellate calcareous granules (Pl. LVII, figs. 3, 4, 6, and 8). *Individuals* dispersed in a nearly quincunx order; *abdomen* pedunculated. *Common orifice* rather inconspicuous.

Diameter of mass variable, generally about an inch (25 mm.) or upwards.

Hab.—On the roots of *Laminaria* and on other marine bodies.

On most parts of our coasts.

England.—Northumberland coast (*Alder*). Isle of Man (*Alder*).

Wales.—[Garth Ferry, Carnarvonshire (*Alder*).] Menai Straits, Anglesey (*Alder*).

Ireland.—Belfast Bay, Antrim, and the north of Ireland generally; [Clew Bay, Mayo] (*Thompson*).

Channel Islands. — [Parella Bay, Guernsey (*Norman*).]

First record.—Thompson, 1843.

[The figures given on Pl. LVII probably represent colour-varieties only.]

2. **Leptoclinum asperum** Milne Edwards.

(Plate LVIII, fig. 1, and fig. 109 in text.)

Leptoclinum asperum Milne Edwards Obs. Ascidies comp. [1841], p. 82, [in Mém. Acad. Sci. Inst. France, XVIII (1842), p. 298,] pl. viii, f. 3; [Thompson in Rep. Brit. Assoc. for 1843 (1844), p. 264, and in Ann. Nat. Hist. (1) XIII (1844), p. 434;] Forbes & Hanley Brit. Moll. I [1848], p. 17; [Cocks in Rep. R. Cornw. Polyt. Soc. for 1849 (1850), p. 74;] Thompson Nat. Hist. Ireland, IV [(1856), p. 362; Norman in Zoologist, XVIII (1860), p. 7249; Ansted & Latham Channel Isl. (1862), p. 219; Grube Insel Lussin Meeresf. (1864), p. 59].

Colony (Pl. LVIII, fig. 1) incrusting, coriaceous, thin, rough with little conical papillæ placed near to

Fig. 109.—Part of a colony of *Leptoclinum asperum*. Enlarged. (M. Edwards, pl. viii, f. 3 *a*.)

or confluent with the branchial apertures (fig. 109); colour dull yellowish white. In other respects resembling the last species.

Hab.—Generally found associated with *L. maculosum*. [On the roots of *Laminaria digitata*, *Cystoseira ericoides*, etc. (*Cocks*).]

England.—[Falmouth, Cornwall (*Cocks*).]

Ireland.—North coast, [and Clew Bay, Mayo] (*Thompson*).

Channel Islands.—Guernsey (*Alder*).

First record.—[Thompson, 1843.]

Specimens from Gouliot Caves, Sark, presented to us by Dr. Bowerbank show the distinct papillose

character of *L. asperum*, while some of the specimens have purplish or brownish undulating lines as in *L. maculosum*.

3. **Leptoclinum durum** Milne Edwards.

(Plate LVIII, figs. 2–6.)

Leptoclinum durum Milne Edwards Obs. Ascidies comp. [1841], p. 82, [in Mém. Acad. Sci. Inst. France, XVIII (1842), p. 298,] pl. viii, f. 4; [Thompson in Rep. Brit. Assoc. for 1843 (1844), p. 264, and in Ann. Nat. Hist. (1) XIII (1844), p. 434; Grube Insel Lussin Meeresf. (1864), p. 59; Norman in Rep. Brit. Assoc. for 1868 (1869), p. 303].

[*Amaroucium aureum* Deshayes in Cuvier's Règne Anim., Moll. (*cir.* 1845), pl. cxxx, f. 1.]

Leptoclinum aureum Forbes & Hanley Brit. Moll. I [1848], p. 17; [Cocks in Rep. R. Cornw. Polyt. Soc. for 1849 (1850), p. 74;] Thompson Nat. Hist. Ireland, IV [1856], p. 362; [Dickie in Rep. Brit. Assoc. for 1857 (1858), p. 111].

Colony thin, incrusting, tough, coriaceous, of a uniform buff or chamois-leather colour (Pl. LVIII, figs. 5 and 6), sometimes inclining to flesh-colour (Pl. LVIII, figs. 2 and 3); the surface containing calcareous granules (Pl. LVIII, fig. 4), and more or less distinctly furrowed by undulating lines. *Common excretory orifices* large. *Individuals* rather closely set. *Branchial apertures* prominent and deeply 6-cleft. *Abdomen* nearly sessile.

Diameter about an inch (25 mm.).

Hab.—[? Moderately deep water. On the stem and roots of *Laminaria digitata* from deep water (*Cocks*).]

England.—Craster, Northumb. (*Stanger*). [Gwyllyn-vase, Swanpool, Pennance, Bar, etc., Falmouth, Cornwall (*Cocks*).] Douglas Bay, Isle of Man (*Alder*).

Ireland.—Strangford Lough, Down, dredged (*Thompson & Hyndman*). [Clew Bay, Mayo (*Thompson*).]

First record.—[Thompson, 1843.]

4. **Leptoclinum fulgens** Milne Edwards.

(Plate LVIII, figs. 7–10, and fig. 110 in text.)

Leptoclinum fulgens Milne Edwards Obs. Ascidies comp. [1841], p. 83, [in Mém. Acad. Sci. Inst. France, XVIII (1842), p. 299,] pl. viii, f. 5; [Ansted & Latham Channel Isl. (1862), p. 219; Grube Insel Lussin Meeresf. (1864), p. 59, and in Abh. schles. Ges. vaterl. Cultur, 1868–69 (1869), pp. 105, 125].

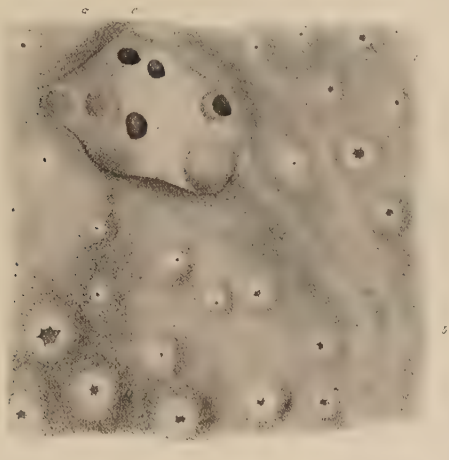

Fig. 110.—Part of a colony of *Leptoclinum fulgens*. (M. Edwards, pl. viii, f. 5 *a*.)

Colony incrusting, thin when on a flat surface (Pl. LVIII, figs. 7 and 10), but more massive when incrusting zoophytes, rather less coriaceous and more delicate than in the last species, with or without very slight papillæ, and of a brilliant orange-vermilion colour. *Individuals* small; calcareous crystals (Pl. LVIII, fig. 8) very uneven in size and with numerous points (about twelve in the circumference of the larger crystals).

Hab.—On the underside of stones between tide-marks, and on shells and zoophytes.

Channel Islands.—St. Peter's Port, Guernsey, on stones (*Alder*). Off Saint's Point, Guernsey, on shells, etc., dredged (*Norman*).

First record.—[Ansted & Latham, 1862; *coll.* Alder.]

[A *Leptoclinum* belonging to this division of the genus, that is with calcareous crystals, is figured (Plate LIX, figs. 1–6). It was found by Canon Norman off Saint's Point and in Parella Bay, Guernsey, and was named by the authors *L. griseum*, but has not been described by them.]

b. Without calcareous crystals.

5. **Leptoclinum gelatinosum** Milne Edwards.

(Plate LIX, fig. 7, and fig. 111 in text.)

Leptoclinum gelatinosum Milne Edwards Obs. Ascidies comp. [1841], p. 83, [in Mém. Acad. Sci. Inst. France, XVIII (1842), p. 295,] pl. viii, f. 1; [Thompson in Rep. Brit. Assoc. for 1843 (1844), p. 264, and in Ann. Nat. Hist. (1) XIII (1844), p. 434;] Forbes & Hanley Brit. Moll. I [1848], p. 17, pl. A, f. 5; [Cocks in Rep. R. Cornw. Polyt. Soc. for 1849 (1850), p. 74; M. Sars in Nyt Mag. f. Naturvid. VI (1851), p. 154; Gosse Man. Marine Zool. II (1856), p. 33, f. 47;] Thompson Nat. Hist. Ireland, IV [1856], p. 362; [Norman in Zoologist, XV (1857), p. 5707; H. & A. Adams Gen. Recent Moll. II (1858), pl. cxxxvi, ff. 1, 1 *a*; M. Sars in Förh. Vid.-Selsk. Christ. 1858 (1859), p. 66; Ansted & Latham Channel Isl. (1862), p. 219; Grube in Abh. schles. Ges. vaterl. Cultur, 1868–69 (1869), pp. 105, 125].

Colony (Pl. LIX, fig. 7) gelatinous, thin, semi-transparent, white or nearly colourless. *Individuals* irregularly arranged around common cloacal orifices, which are rather large. *Branchial aperture* divided into six deep lobes (fig. 111). *Thorax* white, abdominal viscera yellow, nearly sessile.

Diameter of mass one inch to two inches (25–50 mm.).

Hab.—Under stones between tide-marks and on the roots of *Laminaria*. [Attached to the stem and roots of *Laminaria digitata*, on stones, etc., at low water-mark (*Cocks*).]

England.—Devonshire and Cornwall, under stones (*Alder*). [Gwyllyn-vase, Swanpool, Pennance, etc., Falmouth, Cornwall (*Cocks*).]

Scotland.—[Firth of Clyde (*Norman*).]

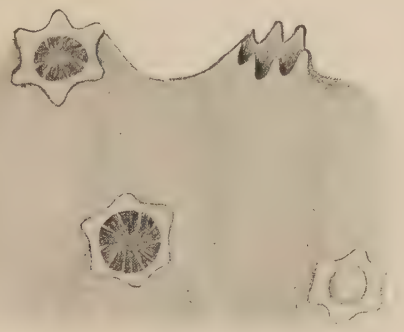

Fig. 111.—Part of a colony of *Leptoclinum gelatinosum*. Enlarged. (M. Edwards, pl. viii, f. 1 *a*.)

Ireland.—Belfast Bay, Down, on *Laminaria*; [and Clew Bay, Mayo] (*Thompson*).

Channel Islands.—Guernsey (*Alder* and *Norman*).

First record.—[Thompson, 1843.]

6. **Leptoclinum punctatum** Forbes.

(Plate LIX, figs. 8–13; and Pl. LX.)

Leptoclinum punctatum Forbes in Brit. Moll. I [1848], p. 18; Alder & Hancock in Trans. Tyneside Nat. Field Club, I [1848], p. 204; [Cocks in Rep. R. Cornw. Polyt. Soc. for 1849 (1850), p. 74; Ansted & Latham Channel Isl. (1862), p. 219].

Colony gelatinous, [shining and translucent,] thin,

incrusting, nearly colourless, spotted with orange and white from the enclosed animals (Pl. LIX, fig. 8). *Individuals* irregularly arranged in sub-longitudinal systems, each with a smallish common orifice (Pl. LIX, fig. 9). *Thoraæ* white, with a dark ruby-coloured, nearly black spot in front (Pl. LIX, fig. 12). *Branchial sac* with four rows of stigmata. *Abdomen* yellow or orange-coloured, sub-sessile (Pl. LIX, fig. 12).

Hab.—On the underside of stones between tide-marks. [On stones at low water-mark (*Cocks*).]

England. — [Whitley (1847) and Cullercoats,] Northumb. (*Alder*). [Gwyllyn-vase, Falmouth, Cornwall (*Cocks*). Isle of Man (*Forbes*).]

First record.—Forbes, 1848.

[Various stages in the development of this species, observed at Tynemouth in August, 1858, are represented on Pl. LX.]

7. **Leptoclinum Listerianum** Milne Edwards.

(Figs. 112 and 113.)

Polyclinum Lister in Phil. Trans. for 1834 [CXXIV, pt. 2], p. 382, pl. xii, f. 1 [3 figs.].

Leptoclinum Listerianum Milne Edwards Obs. Ascidies comp. 1841, p. 84, [in Mém. Acad. Sci. Inst. France, XVIII (1842), p. 300;] Forbes & Hanley Brit. Moll. 1 [1848], p. 17; [Cocks in Rep. R. Cornw. Polyt. Soc. for 1849 (1850), p. 74; Merrifield Nat. Hist. Brighton (1860), p. 81; Ansted & Latham Channel Isl. (1862), p. 219; Grube Insel Lussin Meeresf. (1864), pp. 30, 61].

[*Leptoclinum Listeri* Bronn Thier-Reichs, III (1861), p. 171.]

Colony (fig. 112) forming a grey, transparent, shiny crust, speckled with white and black. *Individuals* dispersed without apparent order; the common cloacal orifices rising into conical or sub-tubular eminences. *Branchial apertures* (fig. 113) with a circle of white spots. *Branchial sac* with four rows of stigmata.

Hab.—Investing the stems of small seaweeds. [On

fronds and stems of *Fucus serratus* and roots of *Cystoseira ericoides* (*Cocks*).]

Fig. 112.—*Leptoclinum Listerianum.* × 4. (After Lister, *loc. cit.*) The arrows show the excretory orifices.

England.—Brighton, Sussex (*Lister* [and *Merrifield*]). [Gwyllyn-vase, Swanpool, Pennance, etc., Falmouth, Cornwall (*Cocks*).]

Channel Islands.—[Guernsey (*Austed & Latham*).]

First record.—Lister, 1834.

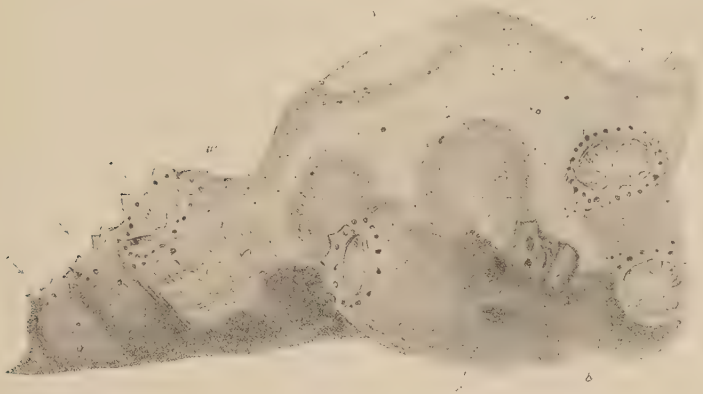

Fig. 113.—*Leptoclinum Listerianum.* × 20. (After Lister, *loc. cit.*) "*a a*, ledges on the interior of the branchial sac, each ending at a moveable spiral process in front, seen in two of the animals; *b*, the heart of one of them; *c*, vent of the same, with the viscera imperfectly seen." The arrows, indicating the direction of the currents, show the branchial apertures and excretory orifices.

This species is distinguished from *L. gelatinosum* by the circle of white spots around the apertures.

Family 7. Botryllidæ.

Individuals [short], with the thorax and abdomen united; arranged in distinct circular or elongated systems around a common cloacal orifice, and enveloped in a sessile incrusting mass; the viscera at the side of the branchial sac.

[The colony is incrusting, usually thin but sometimes thick and fleshy; the systems are circular, elliptical, or branching; the test is usually soft; the branchial sac is large and well developed; the dorsal lamina is plain; the tentacles are simple and do not exceed sixteen in number.]

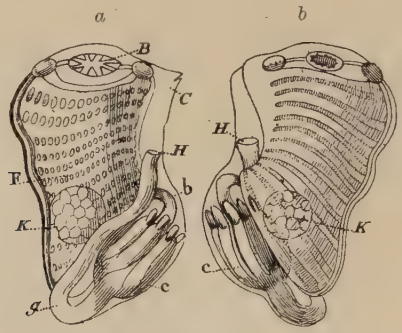

Fig. 114.—Structure of Botryllidæ. *Botrylloides rosaceus* (Sav.) M. Edw. (Savigny, pl. xx, ff. 3^2, 3^3.) *a*. An individual seen from the right side; the tunic supposed to be transparent and the branchial sac visible. *b*. Another individual seen from the left side. *B*, branchial aperture; *C*, atrial aperture; c, stomach; F, branchial sac; *g*, intestinal loop; *H*, anal aperture; *K*, ovary.

Genus 22. **BOTRYLLUS** Gaertner, 1774.

Botryllus Gaertner in Pallas' Spicil. Zool. I, fasc. 10 [(1774), p. 35]; Lamarck [in Mém. du Mus. I (1815), p. 335; [pars] Hist. nat. Anim. s. Vert. [III (1816), p. 106, and] ed. 2, III [1840], p. 505; Savigny Mém. Anim. sans Vert. pt. 2 [1816], p. 197; Cuvier Règne Anim. [II (1817), p. 499; Lamouroux (pars) Exp. méth. Polyp. (1821), p. 76;] Blainville Man. Malac. et Conch.

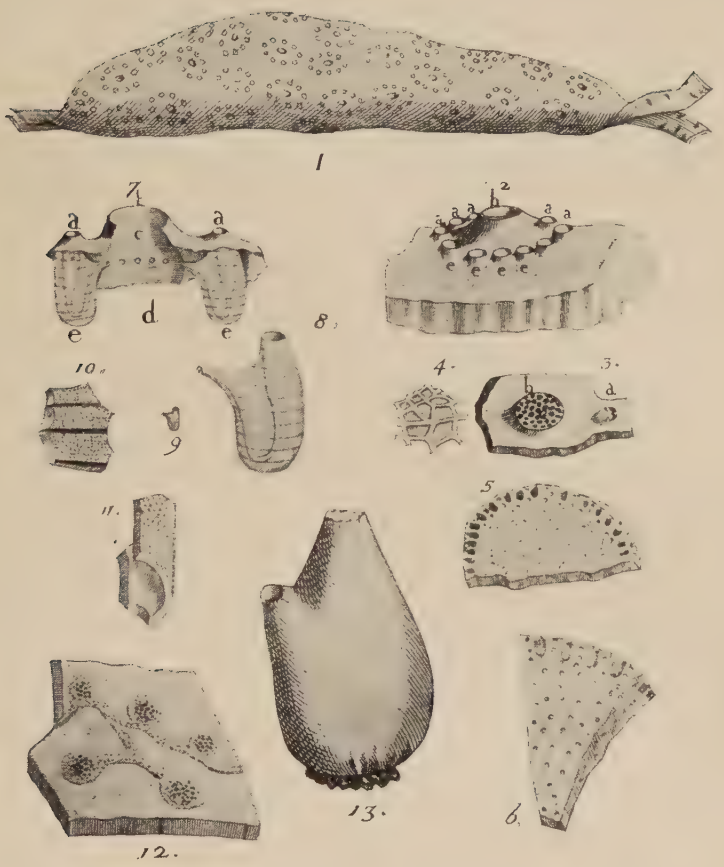

Fig. 115.—Structure of Botryllidæ. "*Botryllus stellatus*" Renier in 'Opusc. scelti Scienze,' xvi (1793), pl. i; *Polycyclus Renieri* Lamarck in 'Mém. du Mus.' I (1815), p. 340. 1. A colony adhering to two fronds of *Zostera*, natural size. 2. A system, enlarged. *a*, branchial apertures; *b*, common excretory orifice; *e*, individuals. 3. Part of the same, viewed from above. *b*, common excretory orifice; *d*, branchial aperture. 4. A portion of the net-like bottom of *b*, fig. 3, further enlarged. 5. Transverse section of the colony, natural size. 6. Part of the same, enlarged. 7. Section of a system, enlarged. *a*, branchial apertures; *c*, common excretory canal; *d*, atrial apertures; *e*, individuals. 8. A single individual, further enlarged. 9. The same, natural size. 10. Part of the tunic (as seen in fig. 8), much enlarged. 11. A portion of the same, seen in profile, further enlarged. 12. Part of the common envelope, much enlarged, showing (probably) germs secreted in it. 13. An *Ascidia*, about natural size, introduced for comparison.

[1825], p. 585; [M. Sars in Froriep's neue Notizen, III (1837), col. 100;] Forbes & Hanley Brit. Moll. I [1848], p. 341; Gosse Man. Marine Zool. II [1856], p. 34; Woodward Man. Moll. [pt. 3 (1856)], p. 341; H. & A. Adams Gen. Recent Moll. [1858], p. 597.

Colony sessile, incrusting, gelatinous. *Individuals* short, ovate, lying nearly horizontally and arranged in numerous regular, star-like, circular or elliptic systems around a common excretory orifice. *Branchial aperture* not quite terminal, without rays; *atrial* rather remote and not far from the opposite end of the body, communicating with the cloacal cavity. *Tentacular filaments* eight, four long and four short. *Ovaries* double, one on each side of the branchial sac.

1. **Botryllus Schlosseri** (Pallas) Savigny.

(Plate LXI, figs. 1 and 2; and figs. 116 to 121 and 125*a* in text.)

Alcyonium ? Schlosser in Phil. Trans. [XLIX, pt. 2 (1757), p. 449]; Borlase Nat. Hist. Cornwall [1758], p. 254, pl. xxv, ff. 1, 2 [*non* 3, 4].

[*Alcyonium carnosum, astericis, radiis obtusis, ornatum* Ellis in Phil. Trans. XLIX, pt. 2 (1757), p. 451, pl. xiv, ff. A–C.]

Alcyonium Schlosseri Pallas Elench. Zooph. [(1766), p. 355]; Linnæus Syst. Nat. ed. 12 [I, pt. 2 (1767)], p. 1294; [Boddaert Lyst Plant-Dieren (1768), pp. 440, 653, pl. xi, ff. 2 *a*, 2 *b*; Berkenhout Nat. Hist. Gt. Brit. Irel. I (1769), p. 210; *op. cit.* ed. 2, I (1789), p. 213; and ed. 3, I (1795), p. 213; Houttuyn Nat. Hist. Dieren, I, 17 stuck (1772), p. 398; P. Müller Linné Natursyst. VI, 2 (1775), p. 782; Gronovius Zooph. Gronov. (1781), p. 374;] Solander Nat. Hist. Zooph. [1786], p. 177; [Wilkens Charakt. Thierpfl. II (1787), p. 188, pl. xviii, f. 62; Bruguière Hist. nat. Vers, I (1789), p. 280, in Encycl. Méth; Gmelin Linnæi Syst. Nat. I, pt. 6 (1791), 3812; Olivi Zool. Adriatica (1792), p. 239; Esper Pflanzenthiere, III (1794), p. 25, pl. vi, ff. 1, 2; Pallas Travels S. Prov. Russ. (Engl. transl.) II (1803), p. 465; Shaw & Nodder Nat. Miscell. XVIII (1806), pl. dcccxlviii; Turton Gen. Syst. Nat. (1806), IV, p. 653, and Brit.

Fauna, I (1807), p. 207; Jameson Mem. Wernerian Soc. I (1811), p. 562].

Botryllus stellatus Gaertner in Pallas' Spicil. Zool. I, fasc. 10 [1774], pp. 35, 37, pl. iv, ff. 1–5*; Bruguière Hist. nat. Vers, [I (1789),] p. 187, in Encycl. Méth.; [Cuvier Tabl. élém. Anim. (1798), p. 656; Lamarck Syst. Anim. s. Vert. (1801), p. 584; Oken Lehrb. Naturgesch. III, 1 (1815), p. 82;] Lamarck [in Mém. du Mus. I (1815), p. 337;] Hist. nat. Anim. s. Vert. [III (1816), p. 108; and] ed. 2, III [1840], p. 506; [Cuvier Règne Anim. (1817), II, p. 499; ed. 2, III (1830), p. 168; and ed. 3 (1836), II, p. 104; Delle Chiaje Mem. Anim. senza Vert. III (1828), p. 85, pl. xxxvi, ff. 12, 13; Rang Hist. nat. Moll. (1829), p. 358; Rasch in Mag. f. Naturvid. XII (1836), p. 323; Kaup Tierreich, III (1837), p. 39; Hollard Nouv. elem. Zool. (1838), p. 44; Gould Rep. Invert. Mass. (1841), p. 320; Leunis Synops. Naturreich, I (1844), p. 412; Deshayes in Cuvier's Règne Anim., Moll. (*cir.* 1845), p. 244; F. E. Schulze in Zeits. f. wiss. Zool. XII, 2 (1862), pp. 176, 183].

Botryllus Schlosseri Savigny Mém. Anim. sans Vert. pt. 2 [1816], p. 200, pl. xx, f. 5; [Fleming in Edinb. Encycl. XIV (1820), p. 631; Lamouroux Exp. méth. Polyp. (1821), p. 76; Fleming in Philos. Zool. II (1822), p. 515, and in Edinb. Philos. Journ. VIII (1823), p. 301; Risso Hist. nat. Europe mérid. (1826), IV, p. 281; Delle Chiaje Mem. Anim. senza Vert. III (1828), p. 94;] Fleming Brit. Anim. [1828], p. 470; [Hoeven Handb. Dierk. II (1830), p. 30; Oken Allgem. Naturgesch. V, 1 (1835), pp. 95, 96; Fleming Moll. Anim. (1837), p. 214; Thompson in Ann. Nat. Hist. (1) V (1840), p. 95, and in Rep. Brit. Assoc. for 1843 (1844), p. 264; Berthold Lehrb. Zool. (1845), p. 517;] Forbes & Hanley Brit. Moll. I [1848], p. 19, pl. A, f. 7,† and pl. B, f. 7; Alder & Hancock in Trans. Tyneside Nat. Field Club, I [1848], p. 204; [Cocks in Rep. R. Cornw. Polyt. Soc. for 1849 (1850), p. 74; Huxley in Engl. Cyclop., Nat. Hist. I (1854), col. 609, ff. *a*, *b*; Hoeven Handb. Zool. (Engl. transl.) I (1856), p. 703;] Thompson Nat. Hist. Irel. IV [1856], p. 362; [Huxley in Carus' Icon. Zootom.

* From the figures of the systems here given (figs. 2–5 reproduced in fig. 121) it seems doubtful whether Gaertner's three varieties pertain to *B. Schlosseri*, as Pallas believed, or to *B. polycyclus* or other species then unnamed; but as the authors of this Monograph did not question this determination, in the uncertainty their synonymy is adopted.

† [See foot-note under *Botryllus polycyclus* (p. 71).]

I (1857), pl. xviii, f. 26; Norman in Zoologist, XV (1857), p. 5707; Dickie in Rep. Brit. Assoc. for 1857 (1858), p. 111; Merrifield Nat. Hist. Brighton (1860), p. 81; Lanszweert in Ann. Soc. Malac. Belg. III (1868), Mem. p. 115; L. & A. Agassiz in Gould's Rep. Invert. Mass. ed. 2 (1870), p. 3, pl. xiii, f. 319].

Botryllus verrucosus Dalyell Rare and Rem. Anim. Scotl. II [1848], p. 156, pl. xxxviii, ff. 1–13, and pl. xl, ff. 1–3.

Colony a thick fleshy [or gelatinous] crust, spreading over stones or forming an amorphous mass on the stems or fronds of Algæ (Pl. LXI, fig. 1); semi-transparent and of a greyish or olive hue, with

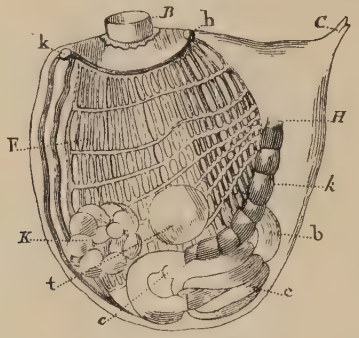

Fig. 116.—Individual of *Botryllus Schlosseri*. Much enlarged. (Savigny, pl. xx, f. 5²). *B*, branchial aperture; b, œsophagus; *C*, atrial aperture; c, stomach: *c*, cæcum of the stomach; F, branchial sac; *H*, anal aperture; h, anterior (branchial) tubercle; *K*, ovary; k, posterior tubercle; *k*, excrement contained in the intestine; t, egg.

imbedded yellow gemmæ. *Individuals* (fig. 116) uniformly yellow in colour, more or less deep, sometimes inclining to green, each with a central dark red spot; arranged in numerous systems of from five to twelve or more [? 10 to 20], forming circular or oval stars with a common sub-tubular excretory orifice (Pl. LXI, fig. 2). The masses often three or four inches (76–102 mm.) in diameter.

Length of individuals [about a line (2 mm.)].

Hab.—On the underside of stones and on seaweeds between tide-marks and in the Laminarian zone.

England.—Common on nearly all the rocky parts of the coast. [Brighton, Sussex (*Merrifield*). Falmouth Harbour (*Schlosser*, *Borlase*); Gwyllyn-vase, Swanpool, Harbour, etc., Falmouth, Cornwall, (*Cocks*).]

Ireland.—Belfast, Antrim; Strangford Lough, Down; and Isle of Lambay, Co. Dublin, on stones (*Thompson*).

Scotland.—[Leith shore, Firth of Forth (*Jameson*). Firth of Clyde (*Norman*)].

First record.—Schlosser, [1757 (*coll.* 1755)].

[If this species is, as Rondelet inferred, the sea-grape of Pliny ('Hist. nat. Mundi,' lib. ix, cap. 2), it

Fig. 117.—The earliest figure of *Botryllus Schlosseri*. Natural size. (From Gesner's copy of Rondelet's figure of *Uva marina*, *op. cit. infra*, 1555.)

is one of the earliest known Tunicates. Rondelet first described and figured it in 1555, in his 'Universæ Aquatilium Historiæ' (vol. ii, p. 130). His figure has been copied by Gesner ('Hist. Anim.' 1558, p. 1248); Aldrovandi ('De reliq. Anim. exsang.' 1606, p. 592); and Jonston ('Hist. nat. Exsang. aquat.' 1650, pl. xx). Gesner's figure, being the clearest, has been photographed for reproduction here (fig. 117).

Copies of other early figures are also given: after Ellis (1757), Borlase (1758), and Gaertner (1774).

The earliest discovery of the species in British seas was published as "An Account of a curious, fleshy, coral-like Substance; in a letter to Mr. Peter Collinson, F.R.S. from Dr. John Albert Schlosser, M.D. F.R.S.

with some Observations on it communicated to Mr. Collinson by Mr. John Ellis, F.R.S." The letter was

Fig. 118.—*Botryllus Schlosseri* incrusting *Fucus vesiculosus*. Natural size. (After Ellis, *loc. cit.*, pl. xiv, f. A.) "Fleshy Alcyonium full of Stars with blunt Rays surrounding a Fucus found in the Sea near Lizard Point" (*Ellis*).

read before the Royal Society 22nd January, 1756, and is of sufficient interest to reproduce here.

Schlosser says: "I hir'd some fishermen to drudge for me in this harbour, in order to examine the small English coral, or *corallium nostras* of *Ray's Synopsis*,

recent in the microscope. The first time they hauled in the drudge, I discovered a most extraordinary sea-production surrounding the stem of an old *fucus teres*: it was of a hardish, but fleshy substance, and more than an inch thick, of a light brown or ash colour, the whole surface covered over with bright yellow shining and star-like bodies, which induced me to believe it to be an undescribed species of alcyonium. I put it immediately into a bucket of sea-water, expecting every moment, that the polypes, which I thought to lodge in those little stars, would extend and shew themselves like those of the alcyonium, N° 2 of *Ray's Synopsis*, commonly called dead-man's hand; but after more

Fig. 119.—Face view of a system of *Botryllus Schlosseri*. Magnified. (After Ellis, *loc. cit.*, pl. xiv, f. C.)

than half an hour's fix'd attention, the vessel lying very quiet all the time, I did not perceive the least appearance of any polypes: upon which I brought them to shore in the sea-water, and then, by means of my microscope, I discovered every one of those stars to be a true animal, and much more beautiful than any polype, but quite of a different structure; which I shall now describe to you.

"Every one of those stars is composed of many thin hollow radii, of a pear-shape form, from five to twelve or more in number, all united intimately at their smaller end: every radius appears broad at the extreme part from the center, and a little convex in the middle of this raised broad part. When the animal is alive, there appears a circular little hole, which contracts

and opens itself frequently. All the radii are of this structure; but their common center, which is formed by a combination of all the small converging extremities, exhibits an opening of a circular, oval, or

FIG. 120.—*Botryllus Schlosseri* incrusting *Fucus serratus*. Natural size. (After Gaertner, *loc. cit.*, pl. iv, f. 1.) *a*, variety with lanceolate rays; *b*, with ovate-lanceolate rays; *c*, with linear rays.

oblong figure, forming a kind of rising rim like a cup, which, when the animal is alive and at rest, contracts and expands itself to many different degrees, with great alertness and velocity, though sometimes it

remains a great while expanded, or contracted. In all these holes, the central large one, as well as the smaller ones (which last I take to be the mouths of the animal) I could not perceive any tentacula, or claws, on the outside; but by looking into them very narrowly, I saw something like very tender little fibres moving at the bottom of their insides.

"By comparing and examining all the various pieces I had collected of this fleshy substance, with its shining stars, I observed, that the size and colour, as well as the very figure of these stars, varied greatly, but the structure of the leaf-like radii, and that of their mouths, and their motions, were perfectly the same, in every one individual.

FIG. 121.—Systems of *Botryllus Schlosseri*. Magnified. (After Gaertner, *loc. cit.* pl. iv, ff. 2—5.) *a*, *b*, and *c* represent the varieties so lettered in fig. 120; *a'* has the excretory common channel "expanded as a cone."

"Many of these bodies I have found so thick and large as to resemble the great branch'd Madrepora coral, especially as they are generally to be met with covering and inclosing the stem and branches of this stiff, ramose fucus."

Ellis, after describing the figures representing this organism (figs. 118 and 119) and stating that he has called it *alcyonium carnosum asteriscis, radiis obtusis, ornatum*, adds: "I have had an opportunity lately of examining this curious, fleshy, coral-like substance in the microscope, and find, that all the interstices between the stars are filled with eggs of different sizes, each adhering by one end to a very fine capillary filament. The smallest eggs are globular, and as they advance in size, change to an oval figure; from

thence they assume the shape of one of the radii of the stars.

"In several of these stars I have observed a smaller radius, as it were, endeavouring to get into the circle; and notwithstanding their seeming connection in the center as one animal, I believe I shall soon be able to shew you, in a drawing from the microscope, that each radius is a distinct animal by itself."

Borlase's account of this discovery is as follows: "The alcyonium is of a middle nature between the herbaceous and horny submarines; its substance fleshy, and sometimes hard even to cartilaginous; shapeless at times; sometimes tubular; generally inhabited by animalcules. Dr. Schlosser . . . discovered one of a curious make dredged up in Falmouth Harbour, September 18, 1755. The alcyonium was brown and thin, and was the *ground* in which the animals had placed themselves in ranks, each in a rose-like shape, making a kind of border round the stem of an old large *fucus*. [See fig. 125*a*, p. 67.] The natural size of the flowers . . . may be seen (fig. I); one is magnified (fig. II); each rose had from five to twelve, but more generally eight leaves, each leaf an aperture in it (*a* fig. II) which is supposed to be a mouth; in the center there is an opening larger than the rest, within which, when the inclosed animal was alive, something like fibres were perceived to move; whether this creature extends those fibres to lay hold of the food which the waves throw in its way, must be referred to further enquiry."

Dr. Borlase states in a foot-note that the specimen was shown to him the day after it was dredged, and was "supposed to be a non-descript."]

2. **Botryllus rubens** Alder & Hancock.

(Plate LXI, figs. 3–7; and fig. 122 in text.)

(?) *Botryllus* Dalyell Rare and Rem. Anim. Scotl. II [1848], p. 167, pl. xli, f. 1.

Botryllus rubens Alder & Hancock in Trans. Tyneside Nat. Field Club, I [1848], p. 204; [Cocks in Rep. R. Cornw. Polyt. Soc. for 1849 (1850), p. 74].
[*Botryllus rubrum* Ansted & Latham Channel Isl. (1862), p. 219.]

Colony (Pl. LXI, figs. 5 and 6) incrusting, thin, transparent, yellowish-brown, with numerous opaque yellow granules. *Individuals* (Pl. LXI, fig. 7) variegated with red and yellow, and of various shades from reddish yellow to dark brick-red: a circle of dark red usually surrounding the branchial aperture, with a

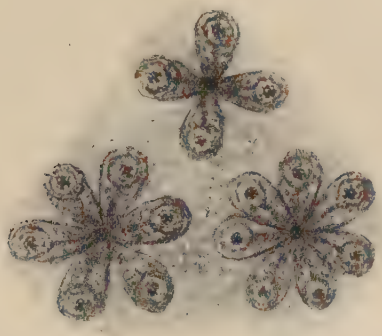

Fig. 122.—*Botryllus rubens*. Systems of from four to seven individuals. Enlarged.

second at a little distance from it, and an interrupted streak down the centre of the thorax; the remainder of the body pale red or yellowish, thickly sprinkled with minute yellowish white spots. The systems (fig. 122) circular and a little apart, consisting of from four to fourteen each: common [excretory] orifice rather small.

Diameter of the mass about an inch and a half to two inches (38–50 mm.).

Hab.—On the underside of stones between tide-marks.

England.—Cullercoats, Northumb., frequent (*Alder*

& Hancock). [Selley's beach, Falmouth, Cornwall (*Cocks*).]

First record.—Alder & Hancock, 1848.

This species is distinguished from the last by the thinness of the general envelope, and by the smaller size and variegated reddish colour of the individuals.

A variety (Pl. LXI, figs. 3 and 4) is marbled with red and has a yellow central line.

3. **Botryllus virescens** Alder & Hancock.

(Plate LXI, figs. 8–11; and figs. 123 and 124 in text.)

Botryllus virescens Alder & Hancock in Trans. Tyneside Nat. Field Club, I [1848], p. 205; Forbes & Hanley Brit. Moll. II [1849], p. 370; [Cocks in Rep. R. Cornw. Polyt. Soc. for 1849 (1850), p. 74].

Colony (Pl. LXI, figs. 8 and 9) incrusting, semi-transparent, olive-brown in colour, sprinkled with

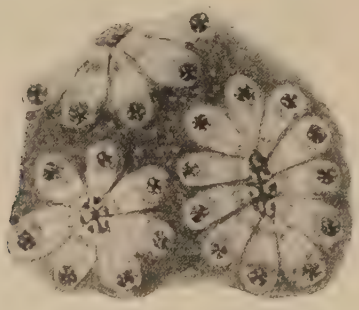

Fig. 123.—*Botryllus virescens.* Systems of from seven to eleven individuals. Enlarged.

yellow granules. *Individuals* grass-green, varying to greenish-yellow and occasionally to pale grey; the colour generally confined to the lower and middle portions of the animal, the upper part being so nearly the colour of the enveloping mass (Pl. LXI, fig. 10) as to be with difficulty distinguished from it. *Branchial aperture* large with a faint red margin. *Tentacular*

filaments pale yellow. The individuals arranged in circular or oval systems (figs. 123 and 124) of from six to twelve around a largish common aperture margined with red.

Diameter of the mass from one to two inches (25–50 mm.).

Hab.—On the underside of stones between tide-marks. [On stones and on stems of *Laminaria digitata*, etc. (*Cocks*).]

England.—Cullercoats, Northumb. (*Alder & Hancock*). [Falmouth, Cornwall (*Cocks*).]

First record.—Alder & Hancock, 1848.

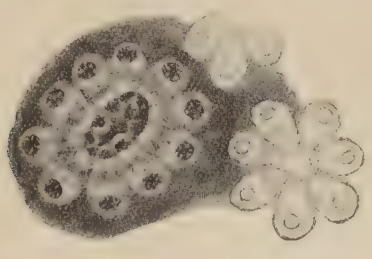

Fig. 124.—A variety of *Botryllus virescens*. Systems of from seven to ten individuals. Enlarged.

When magnified the colour of the colony in this species is shewn to be formed by a copious sprinkling of opaque spots, of varying intensity on the lower part and sometimes extending around the disc.

[A very pretty variety, with a red thorax and a larger excretory orifice to the systems than in the type, is figured (Pl. LXI, fig. 11, and fig. 124 in text.)]

4. **Botryllus smaragdus** Milne Edwards.

[? *Botryllus Borlasii* Fleming.]

(Plate LXII, fig. 1; Pl. LXVI, fig. 1; and fig. 125 *b* in text.)

[? *Alcyonium* Borlase Nat. Hist. Cornwall (1758), p. 254, pl. xxv, ff. iii and iv.]

[? *Botryllus Borlasii* Fleming in Edinb. Encycl. XIV, (1820), p. 631; Philos. Zool. (1822) II, p. 515; and Moll. Anim. (1837), p. 214.]

Botryllus smaragdus Milne Edwards Obs. Ascidies comp. [1841], p. 91, [in Mém. Acad. Sci. Inst. France, XVIII (1842), p. 307, pl. vi, f. 6, and pl. vii, f. 4; (?) Thompson in Ann. Nat. Hist. (2) I (1848), p. 64;] Forbes & Hanley Brit. Moll. I [1848], p. 22; [Cocks in Rep. R. Cornw. Polyt. Soc. for 1849 (1850), p. 74;] Thompson [in Rep. Brit. Assoc. for 1852 (1853), p. 293, and] Nat. Hist. Ireland, IV [1856], p. 363; [Norman in Zoologist, XVIII (1860), p. 7247; Bronn Thier-Reichs, III (1861), pl. xiv, ff. 16, 17; Ansted & Latham Channel Isl. (1862), p. 219; Grube in Abh. schles. Ges. vaterl. Cultur, 1868–69 (1869), pp. 111, 112, 125].

Colony (Pl. LXII, fig. 1) incrusting, olive-green with dark green granules. *Individuals* arranged in circles of from six to twelve (Pl. LVI, fig. 1), large, emerald-green in colour, more or less intense, with a large yellowish-green or golden-coloured pyriform area on the thorax, frequently extending around the branchial aperture: this area being marked with a longitudinal green line, and others radiating from it, in the point of junction of which is a vermilion or orange spot. *Branchial aperture* large.

Hab.—On stones and fuci within tide-marks.

England.—Not infrequently on the Cornish coast in 1847 (*Alder*). [Selley's beach, Falmouth, Cornwall (*Cocks*). ? Careg-Killas, Mount's Bay, Cornwall (*Borlase*).]

Ireland.—[Hollywood,] Belfast Bay, Antrim; a specimen obtained by Dr. Drummond, 1846 (*Thompson*).

First record.—Forbes & Hanley, 1848; *coll.* Alder.

This differs from the last species in the larger size of the individuals, and in their more brilliant [and decidedly green] colour, as well as in the distinct thoracic markings. British specimens require further examination.

[There can be but little doubt that this is the species

found by Dr. Borlase in Mount's Bay, Cornwall, and described and figured by him in 1758. Usually quoted as equivalent to the species which he figured with it (*Botryllus Schlosseri*), so early as 1820 Fleming recognized it as distinct and named it *Botryllus Borlasii*. The authors of the present monograph placed it under *B. bivittatus*, a species from which it differs entirely in colour.

Borlase, after describing *Botryllus Schlosseri*, says: "Somewhat different from this, though of the same tribe, was an alcyonium which I found on a ledge

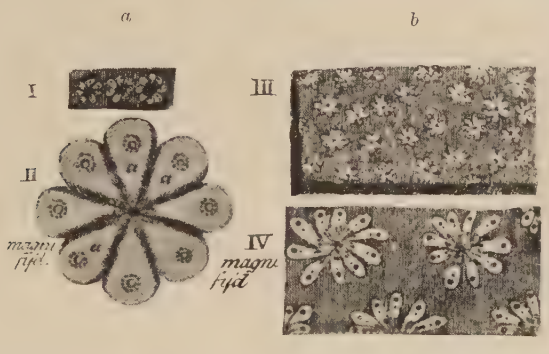

Fig. 125.—Borlase's two species of *Botryllus* referred by him to *Alcyonium*. Natural size and magnified. *a*, *B. Schlosseri*. *b*, ? *B. smaragdus*. (After Borlase, *loc. cit.*)

called Careg-killas, in Mount's Bay, where, as I was tumbling over the moveable rocks, I found one coated with a transparent, callous substance, spread on some rocks about six inches, in one near two feet square at a medium: the coating was about one sixth of an inch thick; the ground was dark green; the flowers consisted of ten obtuse petals, which were of a vivid yellow green; each petal was in two places pierced of the *field* (as the heralds term it); that is, had two specks in each (in this differing from the foregoing) which transmitted the colour of the *field*; the flowers and ground together make so pretty a piece of tapestry, that one might be surprised to find such colouring and

workmanship hid, as it were industriously, under a rock; but the works of Nature are every where well finished, and cannot be otherwise than exact and beautiful in their degree. Part of this coating, with its roses in their natural state, may be seen (fig. III), magnified (fig. IV)."

If this description be compared with the figures on Pl. LXVI of *Botryllus smaragdus* (fig. 1) and *B. bivittatus* (fig. 4), it will be seen how closely it agrees with the former and greatly differs from the latter, the identity of the species with *B. smaragdus* being also borne out by Borlase's figures.]

5. **Botryllus gemmeus** Savigny.

(Plate LXII, fig. 2, and Pl. LXVI, fig. 2.)

Botryllus gemmeus Savigny Mém. Anim. sans Vert. pt. 2 [1816], p. 203; [Fleming Philos. Zool. (1822), II, p. 515; Delle Chiaje Mem. Anim. senza Vert. III (1828), p. 95; Fleming Moll. Anim. (1837), p. 214;] Lamarck Hist. nat. Anim. s. Vert. ed. 2, III [1840], p. 507; [Delle Chiaje Descriz. Anim. Invert. III (1841), p. 18;]; Milne Edwards Obs. Ascidies comp. [1841], p. 89, [in Mém. Acad. Sci. Inst. France, XVIII (1842), p. 305,] pl. vi, f. 5; [Thompson in Rep. Brit. Assoc. for 1843 (1844), p. 264, and in Ann. Nat. Hist. (1) XIII (1844), p. 435; Deshayes in Cuvier's Règne Anim., Moll. (*cir.* 1845), pl. cxxviii, f. 1; Cocks in Rep. R. Cornw. Polyt. Soc. for 1849 (1850), p. 74;] Thompson Nat. Hist. Ireland, IV [1856], p. 362; [Norman in Zoologist, XVIII (1860), p. 7247].

Colony (Pl. LXII, fig. 2) forming a thin gelatinous [sub-orbicular] crust, greyish or brownish with the marginal tubes yellow. *Individuals* rather small, yellow or golden-coloured in the middle, with six lines radiating from a centre; the upper and lower portions pale violet-coloured; set in distinct circular systems of from five to twelve [or more] (Pl. LXVI, fig. 2). Both apertures bordered with white or yellow.

Diameter of general mass about an inch (25 mm.). *Length* of individuals one third of a line (0·7 mm.).

Hab.—On stones at low water-mark and adhering to Fuci. [Attached to stems and fronds of *Fucus serratus*, etc. (*Cocks*).]

England.—[Selley's, Oliver's, and Glasson's beaches, Falmouth, Cornwall (*Cocks*).] Ballaugh, Isle of Man, on stones (*Forbes*).

Ireland.—Belfast Bay, Antrim, on Fuci, dredged by Edmund Getty, [and Clew Bay, Mayo] (*Thompson*).

First record.—[Thompson, 1843.]

6. **Botryllus violaceus** Milne Edwards.

(Plate LXII, figs. 3–5.)

Botryllus violaceus Milne Edwards Obs. Ascidies comp. [1841], p. 89, [in Mém. Acad. Sci. Inst. France, XVIII (1842), p. 305,] pl. vi, ff. 4, 4 *a*, and pl. vii, ff. 3–3 *b*; [Deshayes in Cuvier's Règne Anim., Moll. (*cir.* 1845), pl. xxviii, f. 2; Löwig & Kölliker in Ann. Sci. Nat. (3), Zool. V (1846), p. 217, pl. vi, f. 28; and in Arch. Sci. Nat. III (1846), pp. 210, 297;] Forbes & Hanley Brit. Moll. I [1848], p. 22; [Thompson in Ann. Nat. Hist. (2) I (1848), p. 64; Cocks in Rep. R. Cornw. Polyt. Soc. for 1849 (1850), p. 74; Rupert Jones in Todd's Cyclop. Anat. IV, pt. 40 (1850), p. 1191, f. 771, and p. 1196, f. 774 *b*; Eyton in Ann. Nat. Hist. (2) X (1852), p. 436;] Thompson [in Rep. Brit. Assoc. for 1852 (1853), p. 293, and] Nat. Hist. Ireland, IV [1856], p. 363; [Woodward Man. Moll. pt. 3 (1856), p. 341, pl. xxiv, f. 8; Owen Moll. in Encycl. Brit. ed. 8, XV (1858), p. 332; Bronn Thier-Reichs, III (1861), pp. 115, 187, pl. xiv, f. 18; Ansted & Latham Channel Isl. (1862), p. 219].

Colony (Pl. LXII, figs. 3 and 5) a thickish, semi-transparent, olive-coloured crust, with white or blue imbedded gemmæ. *Individuals* forming circular or elliptical systems of from five to twelve or more (Pl. LXII, fig. 4), of a deep indigo-blue colour, sometimes bordering upon violet, rather paler around

the branchial aperture; the thorax from near that aperture downwards marked with a double line of opaque white, broadest above and ending on the margin of the tubular common orifice; these lines sometimes yellowish and occasionally broader and confined more exclusively to the base.

Diameter of the mass from two to three inches (50–76 mm.). *Length* of individuals three-quarters of a line (1·2 mm.).

Hab.—On the stems of Fuci, more rarely on stones, at and beyond low water-mark. [On stones, *Fucus serratus*, etc. (*Cocks*).]

England.—Devonshire and Cornwall, not uncommon (*Alder*). [Falmouth, Cornwall (*Cocks*).]

Ireland.—Belfast Bay, Antrim (*Thompson*).

Channel Islands.—Guernsey (*Alder*).

First record.—Forbes & Hanley, 1848; [*coll.* Alder].

7. **Botryllus badius** *sp. nov.*

(Plate LII, figs. 6–9.)

Colony (Pl. LXII, fig. 6) a thickish, semi-transparent crust, enveloping seaweeds; fawn-coloured, with numerous white gemmæ and marginal tubes. *Individuals* (Pl. LXII, figs. 8 and 9) of a deep brown colour variegated with darker shades of the same, arranged in circular or elliptical systems of from six to eighteen or twenty around a wide central orifice (Pl. LXII, fig. 7). *Branchial aperture* with a white rim and a white spot or streak below it; *atrial aperture* conspicuously bordered with white, and with a faint interrupted white line on the upper part of the body.

Diameter of the mass an inch to an inch and a half (25–38 mm.). *Length* of individuals half a line (1 mm.).

Hab.—Incrusting a small Fucus.

England.—Isle of Man, dredged (*Alder*).

First record.—Alder & Hancock.

The *Botryllus* figured in Sir J. G. Dalyell's 'Rare and Remarkable Animals of Scotland' (vol. ii, pl. xli, fig. 2) may belong to this species, but the details are too imperfect for recognition.

8. **Botryllus polycyclus** Savigny.

(Plate LXIII, figs. 1 and 2, and figs.126–128 in text.)

Botryllus stellatus Desmarest & Lesueur [in Journ. de Phys. LXXX (1815), p. 434, pl. i, ff. 14–20;] in Nouv. Bull. Soc. Philom. VI (1815), p. 74, pl. i, [ff. 14–20; and in Isis, 1817, col. 1461, pl. ii, ff. 14–20; Fleming in Edinb. Encycl. XIV (1820), p. 631, and Philos. Zool. II (1822), p. 515; Blainville Man. Malac. et Conch. (1825), p. 586, and (1827), pl. lxxxii, ff. 5, 5*a*; McMurtrie (Engl. transl.) Cuvier's Anim. Kingd., Atlas, III (1837), pl. xliii ter, f. 4. Non *Botryllus stellatus* Gaertner in Pallas' Spicil. Zool. (1774)].

Botryllus polycyclus Savigny Mém. Anim. sans Vert. pt. 2 [1816], pp. 47, 202, pl. iv, f. 5, and pl. xxi; [Lamouroux Exp. méth. Polyp. (1821), p. 76, pl. lxxvii, f. 10; Hoeven Handb. Dierk. II (1830), p. 30; Griffith & Pidgeon (Engl. transl.) Cuvier's Anim. Kingd. XII (1834), pl. x, f. 1; Guérin-Méneville Icon. Règne Anim. Cuvier, II, Moll. (*cir.* 1836), pl. xxxv, ff. 1, 1*a*, 1*b*; Fleming Mollusc. Anim. (1837), p. 214, pl. xviii, f. 60; McMurtrie (Engl. transl.) Cuvier's Anim. Kingd., Atlas, III (1837), pl. xliii, ff. 1, 1*a*, 1*b*; Thompson in Ann. Nat. Hist. (1) V (1840), p. 95, and in Rep. Brit. Assoc. for 1843 (1844), p. 264; Löwig & Kölliker in Ann. Sci. Nat. (3), Zool. V (1846), p. 210, pl. vi, f. 29, and pl. vii, f. 46, and in Arch. Sci. Nat. III (1846), p. 297;] Forbes & Hanley Brit. Moll. I [1848], p. 21 (*non* fig. Pl. A, f. 7)*; Alder & Hancock (?) in Trans. Tyneside Nat. Field Club, I [1848], p. 205; [Cocks in Rep. R. Cornw. Polyt. Soc. for 1849 (1850), p. 74; Eyton in Ann. Nat. Hist. (2) X (1852), p. 436; Gosse Man. Marine Zool. II (1856), p. 34, f. 49; Hoeven Handb. Zool. (Engl. transl.), I

* Pl. A, fig. 7, of 'Brit. Moll.,' called *B. polycyclus* in the description of the plate, represents *B. Schlosseri*. [It was so intended by the authors (see Vol. i, p. 19, of their work), but it is a poor drawing and more like *polycyclus* than *Schlosseri*.]

(1856), p. 703; McAndrew & Barrett in Ann. Nat. Hist. (2) XVII (1856), p. 385;] Thompson Nat. Hist. Ireland, IV [1856], p. 362; [Dickie in Rep. Brit. Assoc. for 1857 (1858), p. 111; H. & A. Adams Gen. Recent Moll. II (1858), p. 597, pl. cxxxiv, ff. 1, 1 *a*; Forbes & Godwin-Austen Nat. Hist. Europ. Seas (1859), p. 158; Merrifield Nat. Hist. Brighton (1860), p. 81; Norman in Zoologist, XVIII (1860), p. 7247; Bronn Thier-Reichs, III (1861), pp. 114, 115, 117, 164, pl. xii, ff. 13–15].

Colony (fig. 126) incrusting, thin, transparent, pale brownish-grey, with the marginal tubes purplish in colour. *Individuals* (fig. 128) forming circular or oval

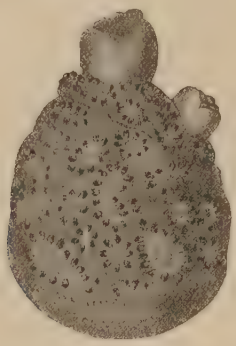

Fig. 126.—*Botryllus polycyclus.* Natural size. (Savigny, pl. iv, f. 5.)

systems of from four to twelve each [8 to 20, Forbes and Hanley] (Pl. LXIII, fig. 2, and fig. 127 in text), of a brownish or purplish hue, occasioned by spots or blotches of claret-colour and blue on a brownish ground; usually one or two blotches of opaque white in the centre of the thorax upon a dark-blue ground, and a circle of white spots around the disc. *General excretory orifices* rather small, the edges thickly sprinkled with white and blue.

Diameter of general mass one to two inches (25–50 mm.). *Length* of individuals [about a line (2 mm.)].

Hab.—On the underside of stones and on Fuci between tide-marks, and in the Laminarian zone. [Chiefly on the fronds of *Laminaria digitata* (*Thomp-*

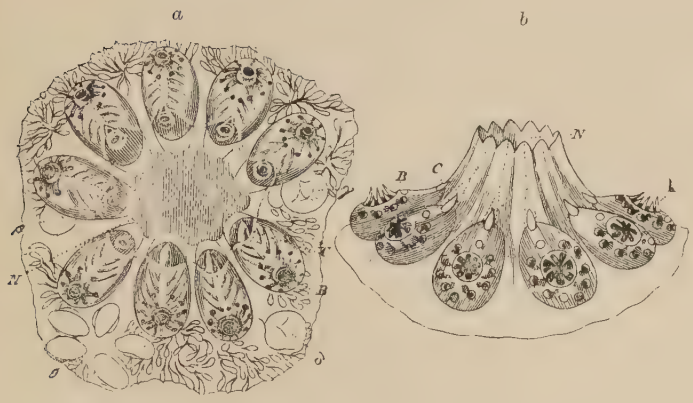

Fig. 127. – Systems of individuals of *Botryllus polycyclus*. Much enlarged. (Savigny, pl. xxi, ff. 1^1 and 1^2.) *a*. A system in a state of contraction, seen from above. *b*. A system in a state of dilatation, seen from the side. *B*, branchial aperture; *C*, atrial aperture; *N*, common excretory cavity; k, tentacular filaments; β, γ, δ, θ, systems commencing to develope.

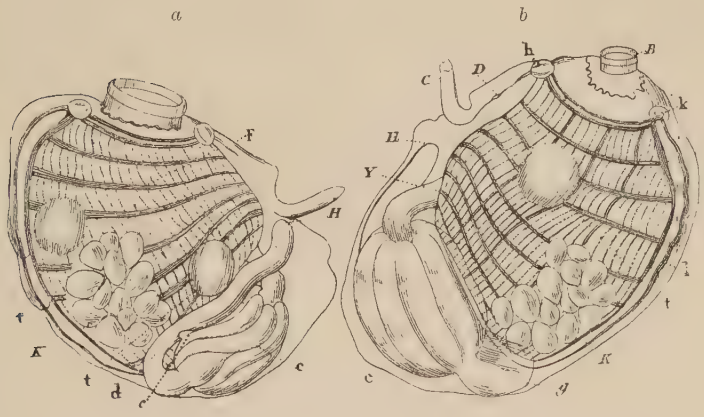

Fig. 128.—Individual of *Botryllus polycyclus*. Much enlarged. (Savigny, pl. xxi, ff. 1^3 and 1^4.) *a*. Right side. *b*. Left side. *B*, branchial aperture; *C*, atrial aperture; c, stomach; *c*, cæcum of the stomach; *D*, nerve-ganglion; d, intestine; F, branchial sac; *g*, intestinal loop; *H*, anal aperture; h, anterior (branchial) tubercle; *K*, ovary; k, posterior tubercle; l, dorsal lamina; t, "egg or germ" out of the ovary and approaching maturity; *Y*, œsophagus.

son). Attached to stems and fronds of *Fucus serratus*, etc. (*Cocks*).]

Very generally distributed around our shores (*Forbes*).

England.—Cullercoats and Whitley, Northumb. (*Alder & Hancock*). [Brighton, Sussex (*Merrifield*). Selly's, Oliver's, and Glasson's beaches, Falmouth, Cornwall (*Cocks*).]

Scotland.—Peterhead, Aberdeen; and Wick, Caithness (*Peach*).

Ireland.—North coast, chiefly on *Laminaria digitata*, more common than *B. Schlosseri*; [Belfast Lough, Antrim; Strangford Lough, Down] (*Thompson*).

First record.—Thompson, 1840.

9. **Botryllus castaneus** Alder & Hancock.

(Plate LXIII, figs. 3 and 4.)

Botryllus castaneus Alder & Hancock in Trans. Tyneside Nat. Field Club, I [1848], p. 205; Forbes & Hanley Brit. Moll. II [1849], p. 371; [Cocks in Rep. R. Cornw. Polyt. Soc. for 1849 (1850), p. 74].

Colony (Pl. LXIII, fig. 3) a thin, pellucid, nearly colourless crust, with scattered brown granules and blackish marginal tubes. *Individuals* large, arranged in irregular systems of from six to ten (Pl. LXIII, fig. 4), of a chestnut colour irregularly blotched with purplish brown and minutely sprinkled with opaque white. *Branchial apertures* small; their lobes rather distant and surrounded with a few large opaque yellowish-white globular bodies.

Diameter of mass four or five inches (100–127 mm.).

Hab.—On the underside of stones in pools between tide-marks.

England.—Cullercoats, Northumb., rare (*Hancock*). [Selley's beach, Falmouth, Cornwall (*Cocks*).]

First record.—Alder & Hancock, 1848; *coll.* Hancock.

10. **Botryllus calyculatus** *sp. nov.*

(Plate LXIII, fig. 5.)

Colony gelatinous, transparent, lead-coloured, nearly globular. *Individuals* pale, spotted with lead-colour; arranged in circles of six to eight around a prominent, thin, cup-shaped common orifice, with a smooth rim, a little angulated on each side (Pl. LXIII, fig. 5). *Branchial aperture* with a raised rim; four triangular plates visible inside with intermediate tentacular filaments.

Diameter of mass about a quarter of an inch (6 mm.).

Hab.—On a *Cellularia* attached to an anchor (*Peach*).

Scotland.—South Bay, Peterhead (*Peach*).

First record.—Alder & Hancock; *coll.* Peach.

The above description is taken from Mr. Peach's notes and sketches of a very curious *Botryllus* got by him at Peterhead. The much-raised cup-formed cloacal aperture is very peculiar. Mr. Peach describes it as having a filmy appearance and waving to and fro when the water was agitated. The triangular tentacular plates are also different from anything hitherto observed in a *Botryllus*. The only specimen found appears to have been in a young state.

11. **Botryllus bivittatus** Milne Edwards.

(Plate LXIII, fig. 6, and Pl. LXVI, fig. 4.)

Botryllus bivittatus Milne Edwards Obs. Ascidies comp. [1841], p. 92, [in Mém. Acad. Sci. Inst. France, XVIII (1842), p. 308, pl. vi, ff. 7, 7 *a*; Thompson in Ann. Nat. Hist. (1) XIII (1844), p. 434, and in Rep. Brit. Assoc. for 1843 (1844), p. 264; Cocks in Rep. R. Cornw. Polyt. Soc. for 1849 (1850), p. 74;] Thompson Nat. Hist. Ireland, IV [1856], p. 362; [Merrifield Nat. Hist. Brighton (1860), p. 81; Norman in Zoologist, XVIII (1860), p. 7247; Ansted & Latham Channel Isl. (1862), p. 219].

Colony incrusting, greyish-drab or white-coloured. *Individuals* of a little darker shade of the same colour, with two linear yellow bands running from the branchial to the cloacal aperture, and continued around each; arranged in rather distant star-like systems of from five to eight, but most frequently six in each circle (Pl. LXIII, fig. 6). *Branchial apertures* rather small.

Hab.—On the underside of stones between tide-marks, and adhering to Fuci.

England.—[Brighton, Sussex (*Merrifield*).] Torquay, Devon (*Alder*). Falmouth, Cornwall (*Alder* [and *Cocks*]).

Ireland.—Belfast Bay, Antrim, dredged adhering to Fuci, by Edmund Getty; [Clew Bay, Mayo] (*Thompson*).

Channel Islands.—[Guernsey (*Austed & Latham*).]

First record.—Thompson, 1844; *coll.* Getty.

12. **Botryllus miniatus** *sp. nov.*

(Plate LXIII, fig. 7; and fig. 129 in text.)

Colony brownish-drab in colour. *Individuals* bright orange-vermilion, with two closely-approximating, deep-yellow, longitudinal lines, not continued around the branchial apertures; *systems* rather closely set, consisting of from eight to twelve individuals arranged circularly (Pl. LXIII, fig. 7, and fig. 129 in text).

Hab.—On the underside of a stone between tide-marks (*Alder*).

England.—Falmouth, Cornwall (*Alder*, 1847).

First record.—Alder & Hancock; *coll.* Alder.

This resembles the last species, of which it may possibly be a variety, but differing in the bright vermilion colour of the individuals, the greater number of them in each system, the closer arrangement of the systems, and in the more compact yellow lines of the

thorax, which do not extend around the branchial aperture. [It seems to be a good species.]

Fig. 129.—*Botryllus miniatus.* Systems, enlarged.

Genus 23. **BOTRYLLOIDES** Milne Edwards, 1841.

Botrylloides Milne Edwards Obs. Ascidies comp. [1841], p. 85, [in Mém. Acad. Sci. Inst. France, XVIII (1842), p. 301;] Forbes & Hanley Brit. Moll. I [1848], p. 23; Woodward Man. Moll. [pt. 3 (1856)], p. 341; H. & A. Adams Gen. Recent Moll. II [1858], p. 598.

Colony sessile, incrusting, gelatinous. *Individuals* ovate, a little elongated, nearly erect, arranged in undulating or branching lines; the animals set in single series on each side, forming systems with ill-defined limits, each having an elongated or branched cloacal cavity. *Branchial aperture* nearly terminal, with an entire rim; *atrial aperture* not far distant, communicating with the cloacal cavity. *Tentacular filaments* usually eight.

1. **Botrylloides Leachii** (Savigny) Milne Edwards.

(Plate LXIV, figs. 1–3; and fig. 130 in text.)

Botryllus Leachii Savigny Mém. Anim. sans Vert. pt. 2 [1816], p. 199, pl. iv, f. 6, and pl. xx, f. 4; [Fleming in

Edinb. Encycl. XIV, pt. 2 (1820), p. 631; Lamouroux Exp. méth. Polyp. (1821), p. 76, pl. lxxvii, f. 9; Fleming Philos. Zool. (1822), II, p. 515; Delle Chiaje Mem. Anim. senza Vert. III (1828), pp. 85, 94, pl. xxxvi, ff. 14–16; Fleming Moll. Anim. (1837), p. 214; Lamarck Hist. nat. Anim. s. Vert. ed. 2, III (1840), p. 507;] Thompson in Ann. Nat. Hist. (1) V [1840], p. 95; [Delle Chiaje Descriz. Anim. Invert. III (1841), p. 18, pl. lxxxv, ff. 14–16; Thompson in Rep. Brit. Assoc. for 1843 (1844), p. 264; Cocks in Rep. R. Cornw. Polyt. Soc. for 1849 (1850), p. 74; Thompson Nat. Hist. Ireland, IV (1856), p. 362; Norman in Zoologist, XV (1857), p. 5707; Grube Ausfl. nach Triest (1861), p. 122].

Botrylloides Leachii Milne Edwards Obs. Ascidies comp. [1841], p. 89, [in Mém. Acad. Sci. Inst. France, XVIII (1842), p. 304;] Forbes & Hanley Brit. Moll. I [1848], p. 23; Alder & Hancock (?) in Trans. Tyneside Nat. Field Club, I [1848], p. 206.

Colony (Pl. LXIV, figs. 1 and 2, and fig. 130 in text) incrusting, moderately thick, gelatinous, transparent,

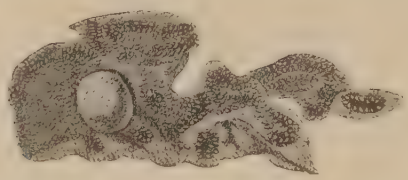

Fig. 130.—*Botrylloides Leachii.* Natural size. (Savigny, pl. iv, f. 6.)

of a pale brownish [or purplish] tint, with the imbedded gemmæ and marginal tubes yellow. *Individuals* ochreous yellow, varying through different shades of the same colour to orange and red, but generally uniform in tint and without markings except a faint paler circle around the disc; arranged in linear series on each side of the common cloacal canals, forming [numerous] systems with ill-defined limits, the rows being continuous in ramifying or anastomosing lines, leaving lozenge-shaped, circular, or oblong spaces between; the excretory orifices usually near the junction of the branches. *Tentacular filaments* yellow.

Diameter of mass from one to three inches (25–76 mm.) or upwards. [*Length* of individuals one-fourth of a line (0·5 mm).]

Hab.—On the underside of stones and amongst rocks between tide-marks, and occasionally investing the roots of *Laminaria digitata*, etc.

England.—Cullercoats and Whitley, Northumb. (*Alder*). [Falmouth, Cornwall (*Cocks*).] Douglas, Isle of Man (*Alder*).

Scotland.—[Firth of Clyde (*Norman*).] Orkney Islands (*Heddle*).

Ireland.—North-east coast (*Thompson*).

First record.—Thompson, 1840.

[Savigny says that the systems are very numerous, much crowded, usually composed of six to twelve individuals, and sometimes of twenty-five to thirty; and that the branchial aperture is white, encircled by a fawn-coloured collar ringed with white. He named the species after Dr. William Leach by whom he says it was communicated to him. It was removed by Milne Edwards from *Botryllus* to his new genus *Botrylloides*, together with *Botryllus rosaceus* (fig. 114, p. 52).

A single individual of a variety of the colour of *B. rubrum* is figured (Pl. LXIV, fig. 3).]

2. **Botrylloides rubrum** Milne Edwards.

(Plate LXIV, fig. 4, and Pl. LXVI, fig. 5.)

Botrylloides rubrum Milne Edwards Obs. Ascidies comp. [1841], p. 87, [in Mém. Acad. Sci. Inst. France, XVIII (1842), p. 303,] pl. vi, f. 3, and pl. vii, f. 2; Forbes & Hanley Brit. Moll. I [1848], p. 24; [Cocks in Rep. R. Cornw. Polyt. Soc. for 1849 (1850), p. 75;] Thompson [in Rep. Brit. Assoc. for 1852 (1853), p. 293, and] Nat. Hist. Ireland, IV [1856], p. 363; [Ansted & Latham Channel Isl. (1862), p. 219].

[*Botrylloides rubra* Gosse Man. Marine Zool. II (1856), pp. 34, 50.]

Colony (Pl. LXIV, fig. 4) pale reddish-brown in colour, with red marginal tubes. *Individuals* bright opaque-red, approaching to orange around the branchial aperture and cloacal line; set in shortish compact systems a little sinuated. *Tentacular filaments* orange.

Diameter of mass about an inch.

Hab.—On stones and Fuci between tide-marks. [On the under surface of stones and on stems of the young *Fucus serratus* (*Cocks*).]

England.—Falmouth, Cornwall (*Alder* [and *Cocks*]). Fowey, Cornwall (*Peach*).

Ireland.—Belfast Bay, Antrim (*Thompson*).

Channel Islands.—[Guernsey (*Ansted & Latham*).]

First record.—Forbes & Hanley, 1848; [*coll.* Alder].

[Milne Edwards says that *Botrylloides rubrum* is remarkable for its brilliant colour, and may be distinguished from *B. rotifer* (p. 83) by the tunic of the individuals (*petites Ascidies*) being opaque and of a very intense red-lead colour; also by the confines of the various systems united into one mass being much more distinct, by the clear demarcation between the individuals in the same system and the much-raised nipple-like form of the anterior extremity of their body, and by the fairly well-developed tentacular filaments.]

3. **Botrylloides albicans** Milne Edwards.

(Plate LXIV, figs. 5–7.)

Botrylloides albicans Milne Edwards Obs. Ascidies comp. [1841], p. 88, [in Mém. Acad. Sci. Inst. France, XVIII (1842), p. 304,] pl. vi, f. 2; Forbes & Hanley Brit. Moll. I [1848], p. 24, pl. A, f. 8; [Alder & Hancock in Trans. Tyneside Nat. Field Club, I (1848), p. 207; Cocks in Rep. R. Cornw. Polyt. Soc. for 1849 (1850), p. 74; Eyton in Ann. Nat. Hist. (2) X (1852), p. 436; Thompson in Rep. Brit. Assoc. for 1852 (1853), p. 293; McAndrew & Barrett in Ann. Nat. Hist. (2) XVII (1856), p. 385;] Thompson Nat. Hist. Ireland, IV [1856], p. 363;

[Grube in Abh. schles. Ges. vaterl. Cultur, 1868–69 (1869), p. 125; Ansted & Latham Channel Isl. (1862), p. 219].

[*Botryllus albicans* Deshayes in Cuvier's Règne Anim., Moll. (*cir.* 1845), pl. xxviii, f. 3; Thompson in Ann. Nat. Hist. (1) XVIII (1846), p. 385.]

Colony (Pl. LXIV, figs. 5 and 7) incrusting, transparent, white with a slight tinge of purple or flesh-colour; marginal tubes white. *Individuals* moderately large, transparent white with an opaque white circle around the branchial aperture, and the under part of the thorax also opaque white; arranged in more or less elongated series, sometimes assuming a subcircular form approaching to that of *Botryllus* (Pl. LXIV, fig. 6).

Diameter of general mass rather small, seldom exceeding half an inch (12 mm.).

Hab.—On stones and Fuci. [On the underside of stones between tide-marks, and on *Fucus vesiculosus*, etc., in rock-pools (*Thompson*). On the under surface of stones and on stems of the young *Fucus serratus* (*Cocks*).]

England.—Bamborough, Northumb. (*Alder*). St. Mary's Island, Northumb. (*Hancock*). [Falmouth, Cornwall (*Cocks*).]

Ireland.—Springvale, Down (*Thompson*).

Channel Islands.—[Guernsey (*Ansted & Latham*).]

First record.—[Thompson, 1846.]

4. **Botrylloides vinosa** *sp. nov.*

Colony incrusting and rather sinuous in outline, thin, transparent, of a pale purplish tinge with white marginal tubes. *Individuals* purplish-brown or claret-coloured, sprinkled with a darker shade of the same colour, and with a bifid white spot behind the branchial aperture; arranged in short systems with single or double rows on each side, not much undulating and sometimes nearly elliptical; the undulating margin of the common cloacal orifice edged with white.

Diameter of mass about an inch and a half (38 mm.).

Hab.—On the underside of stones within tide-marks (*Alder*).

England.—Cullercoats, Northumb., rare (*Alder*).

First record.—Alder & Hancock; *coll.* Alder.

5. **Botrylloides radiata** Alder & Hancock.

(Plate LXIV, figs. 8–11.)

Botrylloides radiata Alder & Hancock in Trans. Tyneside Nat. Field Club, I [1848], p. 206; Forbes & Hanley Brit. Moll. II [1849], p. 371; [Cocks in Rep. R. Cornw. Polyt. Soc. for 1849 (1850), p. 75].

Colony (Pl. LXIV, figs. 8 and 9) transparent, yellowish-olive or nearly colourless, with pale yellow gemmæ and marginal tubes.

Individuals (Pl. LXIV, fig. 10) rather small, pale ochreous yellow or straw-coloured, spotted with white and having a paler rim around the branchial aperture with rays diverging from it and uniting into a disc beyond, giving the whole a petaloid or wheel-like appearance; a darkish line down the thorax; the systems arranged in rather short compact folds, in some parts occasionally becoming nearly circular. The common cloacal orifices at short distances apart, largish, slightly tubular, and with undulating margins.

Diameter of mass an inch (25 mm.) or upwards.

Hab.—On the underside of stones between tide-marks (*Alder*). [On the under surface of stones and on stems of the young *Fucus serratus* (*Cocks*).]

England.—Cullercoats, Whitley, and Bamborough, Northumb. (*Alder*). [Glasson's beach, Bar Point, etc. Falmouth, Cornwall (*Cocks*).] Douglas, Isle of Man (*Alder*).

First record.—Alder & Hancock, 1849; *coll.* Alder.

A transparent white variety with opaque white markings sometimes occurs (Pl. LXIV, fig. 11).

6. **Botrylloides rotifera** Milne Edwards.*

(Figs. 131 and 132.)

[*Botrylloides rotifera* Milne Edwards Obs. Ascidies comp. (1841), p. 85, in Mém. Acad. Sci. Inst. France, XVIII (1842), p. 301, pl. vi, f. 1, and pl. vii, f. 1; Cocks in Rep. R. Cornw. Polyt. Soc. for 1849 (1850), p. 74; Rupert Jones in Cyclop. Anat. IV, pt. 40 (1850), p. 2019, f. 783; Thompson Nat. Hist. Ireland, IV (1856), p. 363; Woodward Man. Moll. pt. 3 (1856), p. 341, pl. xxiv, f. 9.

Botryllus rotifera Thompson in Ann. Nat. Hist. (1) XVIII (1846), p. 386.

Botrylloides rotifer H. & A. Adams Gen. Recent Moll. II (1858), pl. cxxxiv, ff. 2, 2*a*; Bronn Thier-Reichs, III (1861), pl. xiv, ff. 23, 24.]

[*Colony* (fig. 131) gelatinous, thin and spreading, yellowish in colour; *individuals* with semi-transparent

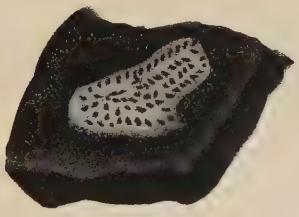

Fig. 131.—*Botrylloides rotifera.* Natural size. (M. Edwards, pl. vi, f. 1.)

tunics, numerous and irregularly scattered, their branchial apertures eight-lobed and with a double ring of little red spots around them.

Diameter of mass about an inch (25 mm.) or less.

Hab.—On the under surface of stones and on stems of the young *Fucus serratus* (*Cocks*).

England.—Falmouth, Cornwall (*Cocks*).

Ireland.—Springvale, Down (*Thompson*).

First record.—Thompson, 1846.

Milne Edwards says that this species is composed of irregular systems (fig. 131) with very numerous

* In the authors' MS. the name only (*Botrylloides rotifera*) occurs.

individuals the anterior part of the body of which is but little raised (fig. 132). The little red spots being close together around the branchial aperture, around the superior margin of the branchial sac, and on the line corresponding with the longitudinal folds of which that sac is furnished interiorly, the two rings with eight diverging lines between them represent fairly well the spokes of a wheel. The line of demarcation beween the several individuals of the same system is not always very distinct. The common cloacal orifice is immediately surrounded by six to eight individuals

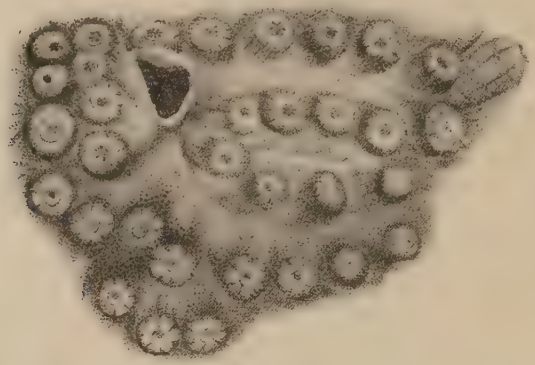

Fig. 132.—*Botrylloides rotifera*. Part of a colony enlarged. (M. Edwards, pl. vi, f. 1 *a*.)

only, but lateral branches spring from it having other individuals on each side arranged with tolerable regularity, their atrial extremities being directed inwards towards the common centre of the system. The branchial aperture is large, and presents inside a circle of tentacular filaments of which four are always well developed, while the others, variable in number, are always rudimentary.

It is unnecessary to give M. Edwards' description of the branchial sac, heart, stomach, and other internal organs, but the root-like processes which are formed at the inferior end of the tunic are peculiar. They proceed into a common envelope, ramify, and bear at

the extremities of their divisions pyriform swellings destined to become new individuals.]

7. **Botrylloides ramulosa** Alder & Hancock.

(Plate LXV, fig. 1.)

Botrylloides ramulosa Alder & Hancock in Trans. Tyneside Nat. Field Club, I [1848], p. 207; Forbes & Hanley Brit. Moll. II [1849], p. 372; [Cocks in Rep. R. Cornw. Polyt. Soc. for 1849 (1850), p. 75].

Colony pellucid, nearly colourless, with a few yellow marginal tubes. *Individuals* arranged in much-involved winding systems (Pl. LXV, fig. 1); their upper half obscure yellowish-brown, the lower pale ochreous yellow or cream-coloured, forming a pale belt down the centre of each system, following the sinuosities.

Diameter of mass upwards of an inch (25 mm.). *Length* of individuals nearly a line (2 mm.).

Hab.—On the underside of stones within tide-marks (*Hancock*). [Also attached to stems of *Fucus serratus* (*Cocks*).]

England.—Cullercoats, Northumb., rare (*Hancock*). [Glasson's beach, Bar Point, etc., Falmouth, Cornwall (*Cocks*)].

First record.—Alder & Hancock, 1848; *coll.* Hancock.

8. **Botrylloides sparsa** Alder.

(Plate LXV, figs. 2–4.)

Botrylloides sparsa Alder in Ann. Nat. Hist. (3) XI [1863], p. 172, [and MS. sp. in Ansted & Latham's Channel Isl. (1862), p. 219.]

Colony (Pl. LXV, fig. 2) rather thick, incrusting, semi-transparent, of a yellowish-brown colour. *Individuals* (Pl. LXV, fig. 4) rather small, yellowish brown thickly sprinkled with dark brown spots, with a circle of sulphur-yellow around the branchial orifice, con-

tinued into a stripe or blotch of the same colour above; arranged in rather short ill-defined branching systems (Pl. LXV, fig. 3) with the common orifice indistinct.

Diameter of mass two inches to two inches and a half (50–63 mm.).

Hab.—On the underside of stones between tide-marks (*Alder*).

Channel Islands.—St. Peter's Port, Guernsey (*Alder*).

First record.—[Ansted & Latham, 1862;] *coll.* Alder.

9. **Botrylloides pusilla** Alder.

(Plate LXV, figs. 5–7.)

Botrylloides pusilla Alder in Ann. Nat. Hist. (3) XI [1863], p. 173, [and MS. sp. in Ansted & Latham's Channel Isl. (1862), p. 219.]

Colony (Pl. LXV, fig. 5) incrusting, semi-transparent. orange flesh-coloured, with yellow marginal tubes, *Individuals* (Pl. LXV, fig. 7) small, bright orange-scarlet in colour, consisting of a minute sprinkling of scarlet on a yellow ground; a yellow spot behind the branchial aperture, the atrial aperture also yellow; the individuals set in crowded double or treble rows, forming ill-defined systems (Pl. LXV, fig. 6). Branchial sac with ten rows of stigmata.

Diameter of mass nearly two inches (50 mm.). *Length* of individuals half a line (1 mm.).

Hab.—On the underside of a stone near low water-mark (*Alder*).

Channel Islands.—Grand Havre, Guernsey (*Alder*).

First record.—[Ansted & Latham, 1862;] *coll. Alder.*

Only one specimen was found of this beautiful and very distinct *Botrylloides*, which has somewhat the habit of a *Leptoclinum*.

Addenda.

Clavelina producta (Vol. II., p. 154).

Fig. 133.

Fig. 134.

Fig. 133.—*Clavelina producta.* Fig. 134.—*C. lepadiformis.* Both natural size. (M. Edwards, pl. ii, ff. 2 and 1.)

[No illustration of *Clavelina producta* having accompanied its description, the omission is here supplied, with a figure of *C. lepadiformis* for comparison.]

Incertæ Sedis.

? **Botryllus conglomeratus** Gaertner.

(Fig. 135.)

[*Botryllus conglomeratus* Gaertner in Pallas' Spicil. Zool. 10 (1774), p. 39, pl. iv, ff. 6 *a–b*; Bruguière Hist. nat. Vers, I (1789), p. 188, in Encycl. Méth.; Olivi Zool. Adriatica (1792), p. 236; Oken Lehrb. Naturgesch. III (1815), p. 83; Savigny Mém. Anim. sans. Vert. pt. 2 (1816), p. 204; Lamarck Hist. Nat. Anim. s. Vert. III (1816), p. 109, and ed. 2, III (1840), p. 507; Cuvier Règne Anim. (1817), II, p. 501; *op. cit.* ed. 2, III (1830), p. 168; and ed. 3 (1836), II, p. 104; Griffith & Pidgeon (Engl. transl.) Cuvier's Anim. Kingd. XII (1834), p. 129.

Alcyonium conglomeratum Gmelin Linnæi Syst. Nat. ed. 13, I, pt. 6 (1791), p. 3618.]

[*Animals* arranged in many rows. *Systems* slightly conical.

The foregoing is Savigny's brief diagnosis of a species observed by Gaertner on the English coast and communicated to Pallas by him. Whether it is correctly referred to *Botryllus* is open to doubt, and even its inclusion with the Tunicata has been questioned.

Gaertner described the individuals as "raisins" with toothless terminal apertures, most of them being obovate, subimbricate, smooth, and whitish in colour, adhering by their blunt ends to the surface of the body (the incrusting mass), which is gelatinous, soft, convex,

FIG. 135.—Two colonies of *Botryllus conglomeratus* (*a*, *a*) on a frond of *Fucus nodosus*, natural size, with one of them magnified.

and adheres to marine plants. The branchial apertures (*terminali perforati*) are fairly large, the other extremity being more slender, incurved, and having very small apertures (atrial ?), while the central cavity (common cloacal canal) is funnel-shaped and encircled with a whitish contractile margin.

Gaertner mentions the "ovules" as being globose, whitish, and spread over the gelatinous substance.

The species is met with but rarely, he said, on a *Fucus*, chiefly *serratus* and *nodosus*.]

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EXPLANATIONS OF THE PLATES.

All the figures, except those ascribed to Milne Edwards, are by Joshua Alder.

Plate 51

PLATE LI.

FIGS.

1–5. *Polyclinum aurantium* M. Edw. (p. 2) 1.—A cluster of colonies: natural size. 2.—A cluster: × 2. 3.—Individuals removed from their common envelope: magnified. 4.—Part of a system showing a few branchial apertures and one common orifice: × 4. 5.—A single colony: natural size (M. Edwards, pl. i, f. 6).

6. *Polyclinum succineum* Alder. (p. 4) A colony: slightly enlarged.

7 and 8. *Polyclinum succineum* var. *subopacum* var. nov. (p. 5) A colony from Gouliot Caves, Sark: × 2. (*P. subopacum* of the authors, but not described by them.)

9–11. *Polyclinum cerebriforme* Alder. (p. 5) 9.—A colony from Bantry Bay: slightly enlarged. 10 and 11.—Clusters of colonies from Hastings: natural size.

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PLATE LII.

Amaroucium proliferum M. Edw. (p. 7)

Figs.
1 and 2. Clusters of colonies from Polperro, Cornwall.
3–5. Clusters from Belgrave Bay, Guernsey.

All natural size.

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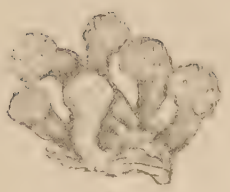

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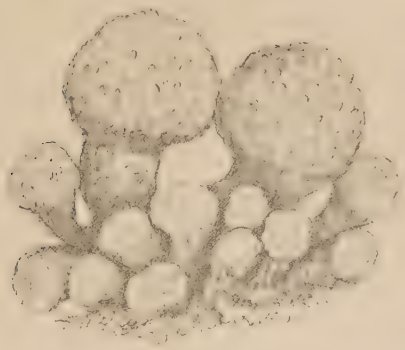

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Plate 53

PLATE LIII.

FIGS.

1–3. *Amaroucium proliferum* M. Edw. (p. 7) 1.—A small colony: natural size. 2.—A larger colony: natural size (M. Edwards, pl. i, f. 3). 3.—A system: enlarged (M. Edwards, pl. i, f. 3*a*).

4–6. *Amaroucium albicans* M. Edw. (p. 9) 4.—A cluster of colonies: natural size. 5.—A system: × 5. 6.—A globular colony found on the upper surface of a stone, and two stalked colonies found suspended from a projecting piece of rock: natural size (M. Edwards, pl. i, f. 3*b*).

7. *Amaroucium papillosum* Alder. (p. 10) Part of a colony of two systems: natural size.

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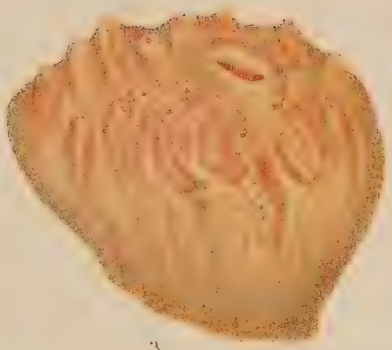

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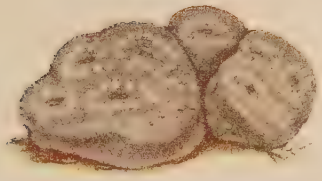

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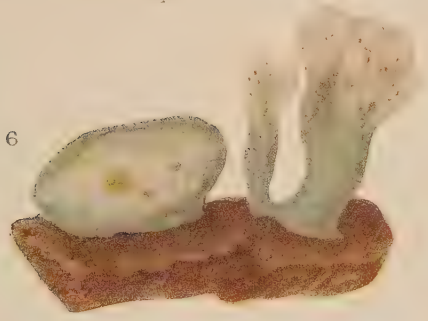

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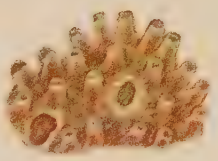

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Plate 54

PLATE LIV.

FIGS.

1–3. *Amaroucium argus* M. Edw. (p. 11) 1.—Clusters of colonies from Polperro, Cornwall: natural size. 2.—The same: × 2. 3.—A system: enlarged (M. Edwards, pl. i, f. 4).

4. *Amaroucium Nordmanni* M. Edw. (p. 14) A colony: natural size (M. Edwards, pl. i, f. 5).

5–7. *Parascidia Forbesii* Alder. (p. 19) Colonies: natural size (7) and slightly enlarged.

8 and 9. *Parascidia Flemingii* Alder. (p. 20) 8.—A cluster of colonies: natural size. 9.—A colony composed of a single system: × 5.

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Plate 55

PLATE LV.

FIGS.

1 and 2. *Aplidium melleum* sp. nov. (p. 26) 1.—Colonies: natural size. 2.—A single colony: × 2.

3–6. *Aplidium glomeratum* sp. nov. (p. 27) 3–5.—Colonies: natural size, slightly enlarged, and × 2. 6.—Section through a colony: × 2.

7–9. ? *Aplidium nutans* Johnst. (p. 27) Colonies: natural size. (See footnote on p. 29.)

10–12. *Didemnum* sps. (p. 35) 10 and 12.—Colonies: natural size. 11.—A larva (of the species depicted in fig. 10): magnified.

13. *Distoma vitreum* M. Sars. (p. 43) A cluster of colonies: natural size.

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Individuals of some of the foregoing species.

Fig.

1. *Polyclinum aurantium* M. Edw. (p. 2)
2. *Amaroucium proliferum* M. Edw. (p. 7)
3. *Amaroucium albicans* M. Edw. (p. 9)
4. *Parascidia Forbesii* Alder. (p. 19)
5. *Parascidia Flemingii* Alder. (p. 20)
6. *Aplidium melleum* sp. nov. (p. 26)
7. *Aplidium glomeratum* sp. nov. (p. 27)
8. *Distoma vitreum* M. Sars. (p. 43)

All considerably magnified.

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Plate 57

PLATE LVII.

Leptoclinum maculosum M. Edw. (p. 44)

Fig.

1.—A colony from Garth Ferry: natural size. 2.—The same: × about 3. 3.—Calcareous granules, composed of crystals, from the same: considerably magnified. 4.—Distinct crystals from the same: highly magnified. 5.—A colony on a root of *Laminaria*: natural size (M. Edwards, pl. viii, f. 2). 6.—Crystals from the same: variously magnified. 7.—A variety from Parella Bay, Guernsey: × 3. 8.—Calcareous crystals from the same: highly magnified.

The calcareous crystals immersed in the common tissue appear when slightly magnified to be spherical concretions, but when highly magnified are seen to be pyramidal star-shaped crystals with smaller ones superposed.

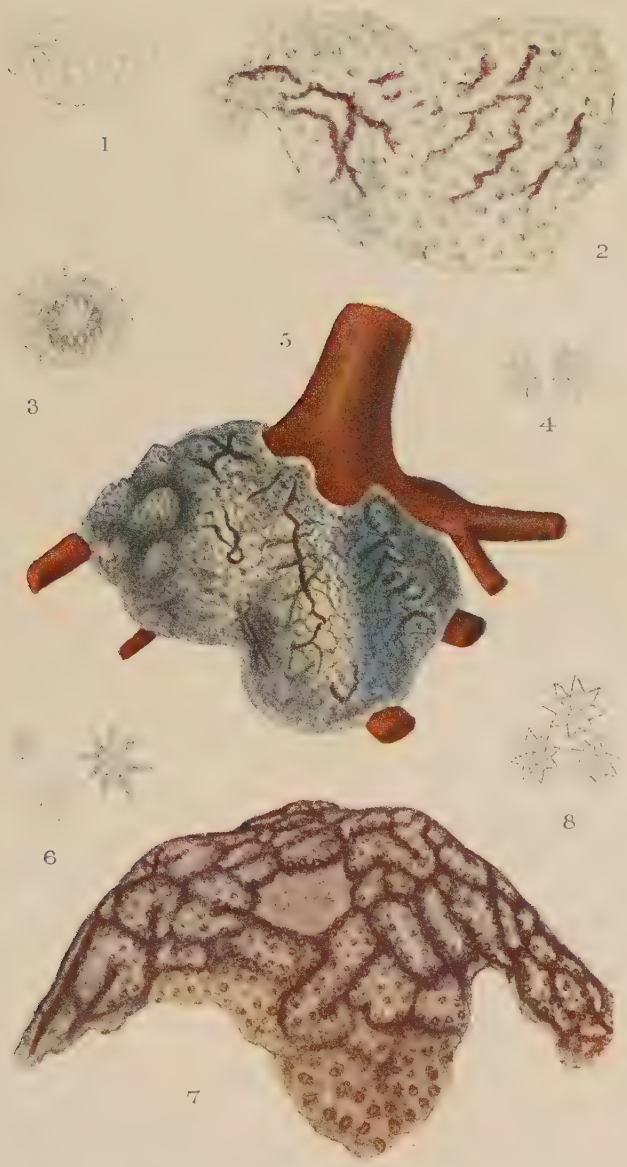
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Plate 58

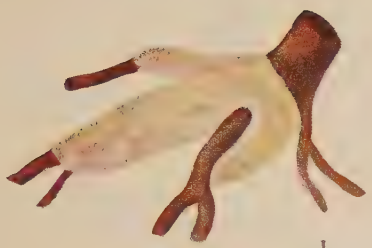
PLATE LVIII.

FIGS.

1. *Leptoclinum asperum* M. Edw. (p. 45) A colony investing a root of *Laminaria*: natural size (M. Edwards, pl. viii, f. 3).

2–6. *Leptoclinum durum* M. Edw. (p. 46) 2.—A colony attached to a stone: natural size. 3.—Part of the same: × 4. 4.—Calcareous granules from the same: magnified. 5.—A colony: natural size (M. Edwards, pl. viii, f. 4). 6.—Part of the same: much enlarged (M. Edwards, pl. viii, f. 4*a*). *a*, individuals with the "labial border" projecting; *b*, one with a dilated aperture, the "labial border" not apparent; *c*, one with a contracted aperture.

7–10. *Leptoclinum fulgens* M. Edw. (p. 47) 7.—A colony from Saint's Point, Guernsey: natural size. 8.—Calcareous crystals from the same: magnified. 9.—Showing the star-like disposition of the same: less highly magnified. 10.—A colony: natural size (M. Edwards, pl. viii, f. 5).



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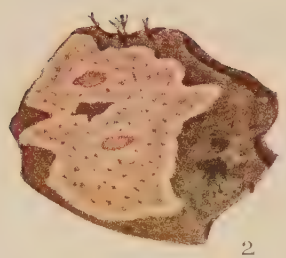

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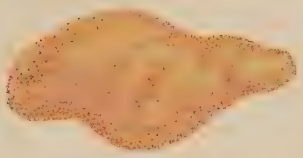

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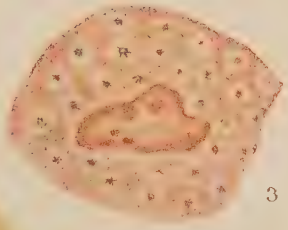

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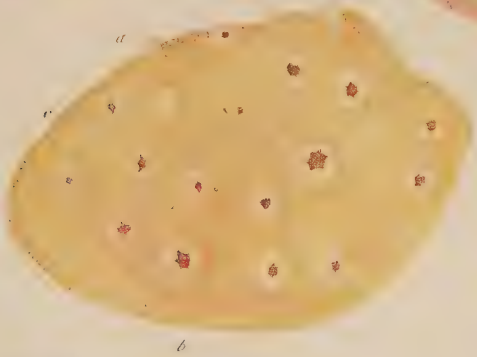

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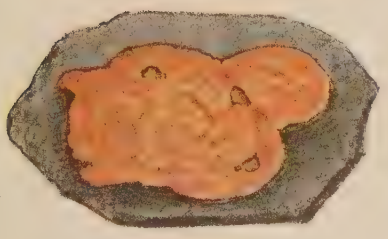

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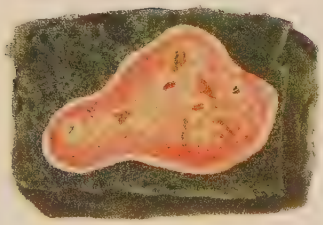


Plate 59

PLATE LIX.

FIGS.

1–6. A new species intended to have been described as *Leptoclinum griseum*. 1.—Colonies incrusting a stem of *Laminaria*, from Parella Bay, Guernsey: natural size. 2.—A colony attached to a stone, from Saint's Point, Guernsey: natural size. 3.—The same: × 2½. 4.—Part of the same: × about 20. 5 and 6.—Calcareous crystals from the same: highly magnified.

7. *Leptoclinum gelatinosum* M. Edw. (p. 48) A colony attached to a root of *Laminaria*: natural size (M. Edwards, pl. viii, f. 1).

8–13. *Leptoclinum punctatum* Forbes. (p. 49) 8.—A colony: natural size. 9.—Part of the same: × about 5. 10 and 11.—Young individuals from Cullercoats: magnified. 12.—A single mature individual with the branchial aperture expanded: × about 20. 13.—Apex of the same with the branchial aperture contracted: similarly magnified.

Plate 60

PLATE LX.

Various stages in the development of *Leptoclinum punctatum*: magnified. (p. 50)

Plate 61

PLATE LXI.

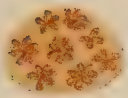
Figs.

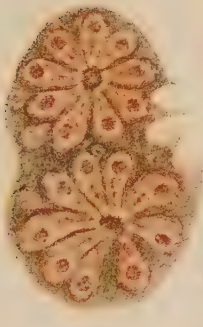
1 and 2. *Botryllus Schlosseri* (Pall.) Sav. (p. 54) 1.—A colony: natural size. 2.—Part of the same: × 5.

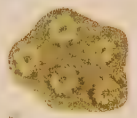
3–7. *Botryllus rubens* A. & H. (p. 62) 3.—Part of a colony of a variety: natural size. 4.—The same: × 5. 5.—Part of a colony of the type: natural size. 6.—Part of the same: × 5. 7.—A single individual: × about 20.

8–11. *Botryllus virescens* A. & H. (p. 64) 8.—Part of a colony: natural size. 9.—Part of the same: × 5. 10.—A single individual: × about 20. 11.—A system of a variety from Falmouth: × 5.

All but the last from Cullercoats.







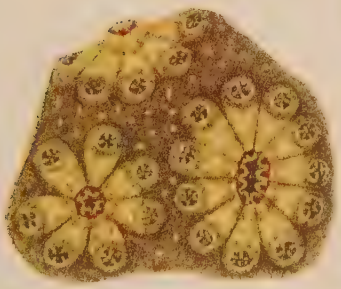


Plate 62

PLATE LXII.

FIGS.

1. *Botryllus smaragdus* M. Edw. (p. 65) Two colonies: natural size (M. Edwards, pl. vi, f. 6).
2. *Botryllus gemmeus* Sav. (p. 68) A colony: natural size (M. Edwards, pl. vi, f. 5).

3–5. *Botryllus violaceus* M. Edw. (p. 69). 3.—Part of a colony from Guernsey: natural size. 4.—Part of the same: × 5. 5.—Part of a colony: natural size (M. Edwards, pl. vi, f. 4).

6–9. *Botryllus badius* A. & H. (p. 70) 6.—A colony: natural size. 7.—Two systems: × 5. 8 and 9.—Single individuals contracted and expanded: × about 20.

Plate 63

PLATE LXIII.

Figs.

1 and 2. *Botryllus polycyclus* Sav. (p. 71) 1.—Part of a colony from Cullercoats: natural size. 2.—The same: × 5.

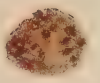
3 and 4. *Botryllus castaneus* A. & H. (p. 74) 3.—Part of a colony from Culllercoats: natural size. 4.—A system: × 5.

5. *Botryllus calyculatus* A. & H. (p. 75) Part of a colony from Peterhead: ? × 5.

6. *Botryllus bivittatus* M. Edw. (p. 75) A colony: natural size (M. Edwards, pl. vi, f. 7).

7. *Botryllus miniatus* sp. nov. (p. 76) A system from Falmouth: ? × 5.

8 and 9. An undescribed *Botryllus*. 8.—A colony from Cullercoats: enlarged. 9.—A single individual: further enlarged.



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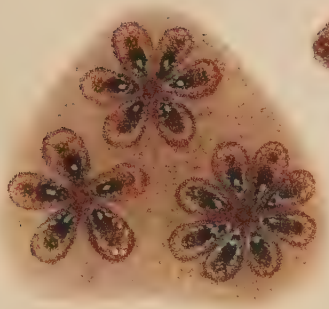

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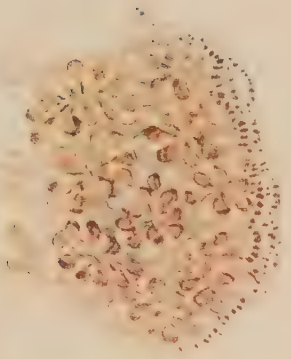

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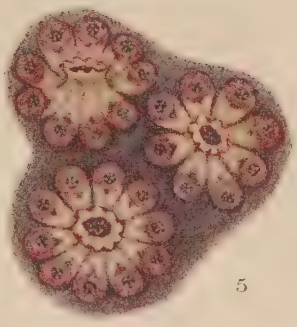

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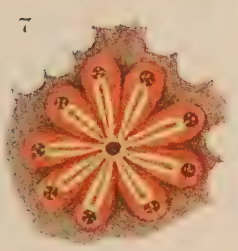

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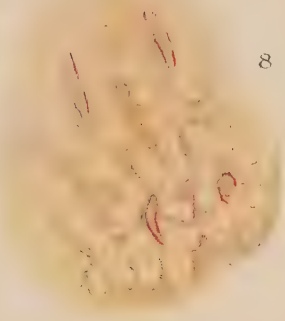

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Plate 64

PLATE LXIV.

Figs.

1–3. *Botrylloides Leachii* (Sav.) M. Edw. (p. 77) 1.—A small colony from Cullercoats: natural size. 2.—Part of the same: × about 4. 3.—A single individual of a variety, from Cullercoats, of the colour of *B. rubrum*: × about 8.

4. *Botrylloides rubrum* M. Edw. (p. 79) Part of a colony: natural size (M. Edwards, pl. vi, f. 3).

5–7. *Botrylloides albicans* M. Edw. (p. 80) 5.—A colony from Bambrough: natural size. 6.—The same: × about 4. 7.—A colony: natural size (M. Edwards, pl. vi, f. 2).

8–11. *Botrylloides radiata* A. & H. (p. 82) 8.—Part of a colony from Cullercoats: natural size. 9.—Part of the same: × 3. 10.—A single individual: × about 20. 11.—A system of a variety from Bambrough: much enlarged.

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Plate 65

PLATE LXV.

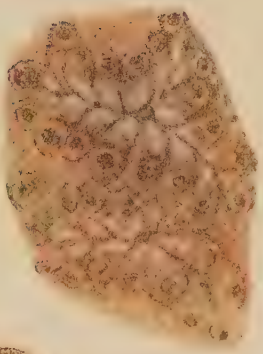
Figs.

1. *Botrylloides ramulosa* A. & H. (p. 85) Part of a colony from Falmouth: × 5.

2–4. *Botrylloides sparsa* Alder. (p. 85) 2.—A colony from Guernsey: natural size. 3.—Part of the same: enlarged. 4.—A single individual: much enlarged.

5–7. *Botrylloides pusilla* Alder. (p. 86) 5.—A colony from Guernsey: natural size. 6.—Part of the same: enlarged. 7.—A single individual: much enlarged.

8–11. An undescribed *Botrylloides* from Douglas, Isle of Man. 8.—Part of a colony: natural size. 9.—A system: much enlarged. 10.—Part of a colony: enlarged. 11.—A branchial aperture: much enlarged.



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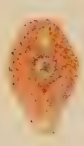

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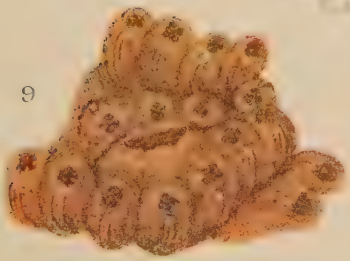

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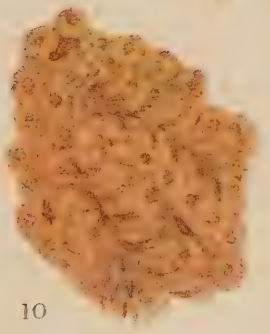

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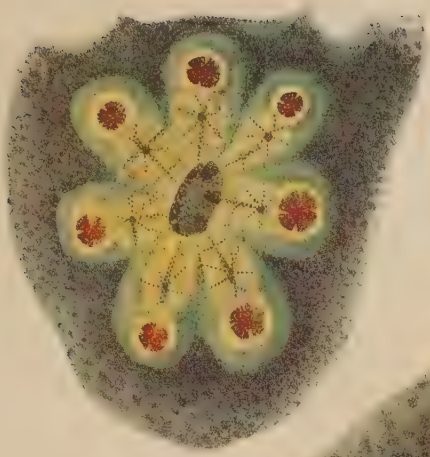
Plate 66

PLATE LXVI.

FIG.

1. *Botryllus smaragdus* M. Edw. (p. 65) (M. Edwards, pl. vi, f. 6*a*.)
2. *Botryllus gemmeus* Sav. (p. 68) (M. Edwards, pl. vi, f. 5*a*.)
3. *Botryllus violaceus* M. Edw. (p. 69) (M. Edwards, pl. vi, f. 4*a*.)
4. *Botryllus bivittatus* M. Edw. (p. 75) (M. Edwards, pl. vi, f. 7*a*.)
5. *Botrylloides rubrum* M. Edw. (p. 79) (M. Edwards, pl. vi, f. 3*a*.)

All the figures are of systems much enlarged.



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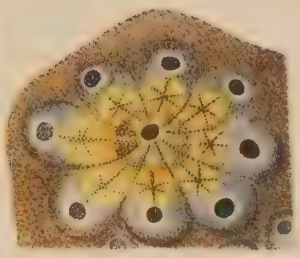

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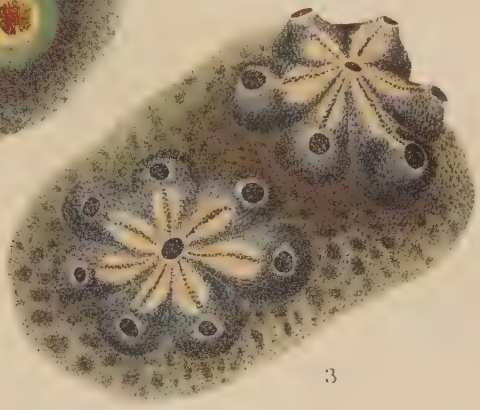

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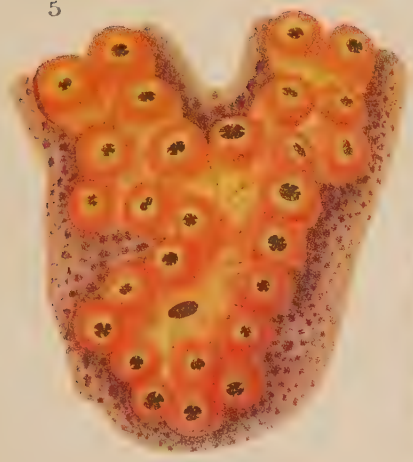

4

SUPPLEMENT.

ADDITIONAL REFERENCES AND LOCALITIES.*

Vol. I.

Ascidia mamillata Cuv. (p. 72).

Ascidia mamillata Eysenhardt in Nova Acta Acad. Leop.-Car. XI, 2 (1823), p. 267, pl. xxxvii, ff. 17–19; Cloquet Syst. Anat. IV, Moll. (1830), pp. 366, 367, in Encycl. Méth.; Johnston in Mag. Nat. Hist. VI (1833), p. 242, and Introd. Conch. (1850), p. 282; Rupert Jones in Cyclop. Anat. IV, pt. 40 (1850), pp. 1187, 1194, 1201, 1205, f. 766; Roy. Coll. Surgeons Cat. Mus. I (1850), p. 267; Leach Synops. Moll. Gt. Britain (1852), p. 239; Owen Comp. Anat. Invert. Anim. ed. 2 (1855), p. 473, f. 178; Grube Ausflug nach Triest (1861), pp. 28, 122, and Insel Lussin Meeresf. (1864), p. 52; Hancock in Jrn. Linn. Soc. Lond., Zool. IX (1867), pp. 315, 345.

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Ascidia mentula O. F. Müll. (p. 75).

Mentula marina informis Bianchi (Plancus) Conchis minus notis, ed. alt. (1760), p. 109, pl. vii, and in Bonon. sci. Comment. V, pt. 1 (1767), p. 243, pl. v, ff. 4–7.

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* Embracing only the period from 1758, the date of the 10th edition of the 'Systema Naturæ,' to 1870.

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Ireland.—Strangford Lough, Down (*Dickie*, 1857).

Vol. II.

Ciona intestinalis (L.) Flem. (p. 9).

Ascidia intestinalis Hammer Fauna Norvegica (1775), p. 188; Blumenbach Handb. Naturgesch. pt. 2 (1780), p. 416; (Fr. transl.) Man. Hist. nat. II (1803), p. 25; and (Engl. transl.) Elem. Nat. Hist. (1825), p. 246; Barbut Genera Vermium, pt. 1 (1783), p. 50, pl. v, f. 3; Bruguière Hist. nat. Vers, I (1789), p. 149, in Encycl. Méth.; Denys de Montfort in Buffon's Hist. nat. Moll. VI (1805), p. 162; Oken Lehrb. Naturgesch. III (1815), p. 216; Goldfuss Handb. Zool. (1820), II, p. 594; Fleming in Edinb. Philos. Journ. VIII (1823), p. 301; Bory de St. Vincent Hist. Nat. Vers, &c. I (1827), p. 135, pl. lxv, f. 3, in Tabl. Encycl. Méth.; Meckel Syst. vergl. Anat. III (1828), p. 54; Cuvier Règne Anim. ed. 2, III (1830), p. 166; Roy. Coll. Surgeons Cat. Mus. I (1831), p. 21; 1833, p. 195; ed. 2, I (1852), p. 196; and (1860), p. 262; Brown Conch. Text-book, ed. 6 (1845), p. 204, pl. xx, f. 7; Cocks Spec. Nat. Hist. Falmouth (1849), p. 3; M. Sars in Nyt Mag. f. Naturvid. VI (1851), p. 157; Forbes Ñat. Hist. Europ. Seas (1859), p. 87; Danielssen in Nyt Mag. f. Naturvid. XI (1861), p. 48; Hancock in Jrn. Linn. Soc. Lond., Zool. IX (1867), p. 327.

Ascidia Schalk De Ascidium structura (1814), 10 pp., 1 pl., 4 text-figs.

Phallusia intestinalis Œrsted Reg. Mar. Œresund (1844), p. 70; Grube Ausflug nach Triest (1861), pp. 22, 58, 122, and Insel Lussin Meeresf. (1864), p. 19.
Ciona intestinalis, Forbes Nat. Hist. Europ. Seas (1859), p. 68; Foster in Qrt. Journ. Micr. Sci. (n.s.) X (1870), p. 59.
? *Ascidia britannica* Leach Synops. Moll. Gt. Britain (1852), p. 238.
Ascidia hyalina ? Sowerby Pop. Hist. Aquarium (1857), p. 15, pl. xiii.
Ascidia vitrea ? Sowerby Pop. Hist. Aquarium (1857), p. 267, pl. xiii.
? *Phallusia corrugata* Lutken in Vid. Medd. For. Kjöbenh. 1860, p. 203.

England.—Dorset (*Forbes*, 1850). Ilfracombe, Devon, on *Phyllopora rubra* (*Sowerby*, 1857).

Corella parallelogramma (O. F. Müll.) Hanc. (p. 25).

Ascidia parallelogramma Bosc Hist. nat. Vers, ed. 2 (1827), I, p. 125; M. Sars in Nyt. Mag. f. Naturvid. VI (1851), p. 156; Grube Insel Lussin Meeresf. (1864), p. 53; Hancock in Jrn. Linn. Soc. Lond., Zool. IX (1867), pp. 313, 326, 333, 338.
Ascidia virginea Cocks Spec. Nat. Hist. Falmouth (1849), p. 10; Eyton in Ann. Nat. Hist. (2) X (1852), p. 436; Thompson in Rep. Brit. Assoc. for 1852 (1853), p. 239; Gosse Nat. Hist., Moll. (1854), p. 314, fig.; McAndrew & Barrett in Ann. Nat. Hist. (2) XVII (1856), p. 385.
Corella parallelogramma Lutken in Vid. Medd. For. Kjöbenh. 1860, p. 204.

England.—Laxey Head, Isle of Man (*Eyton*, 1852).

Molgula conclilega (O. F. Müll.) A. & H. (p. 41).

Ascidia conclilega Oken Lehrb. Naturgesch. III, 1 (1815), p. 215; Bosc Hist. nat. Vers, ed. 2 (1827), I, p. 120; Cocks Spec. Nat. Hist. Falmouth (1849), p. 3; Norman in Zoologist, XVIII (1860), p. 7247; Danielssen in Nyt Mag. f. Naturvid. XI (1861), p. 48; Hancock in Jrn. Linn. Soc. Lond., Zool. IX (1867), pp. 318, 332, 335.

Molgula simplex A. & H. (p. 51).

Molgula simplex Hancock in Jrn. Linn. Soc. Lond., Zool. IX (1867), p. 319.

Eugyra arenosa A. & H. (p. 70).

Molgula tubulosa Cocks Spec. Nat. Hist. Falmouth (1849), p. 6; Danielssen in Nyt Mag. f. Naturvid. XI (1861), p. 49.

Cynthia tubularis Forbes in Rep. Brit. Assoc. for 1850 (1851), pp. 219, 242.

Molgula arenosa Baird Cyclop. Nat. Sciences (1858), p. 56; Hancock in Jrn. Linn. Soc. Lond., Zool. IX (1867), pp. 319, 333.

Scotland.—St. Magnus Bay, Foula Island, and Papa Stour, Shetland Isles, 1845 (*Forbes*, 1850).

Cynthia claudicans Sav. (p. 78).

Cynthia claudicans Norman in Zoologist, XVIII (1860), p. 7247; Grube Ausflug nach Triest (1861), pp. 62, 122, and Insel Lussin Meeresf. (1864), p. 51.

Cynthia squamulosa Ald. (p. 81).

Cynthia squamulosa Hancock in Jrn. Linn. Soc. Lond., Zool. IX (1867), p. 317.

Cynthia ovata A. & H. (p. 84).

Cynthia ovata Hancock (MS. sp.) in Jrn. Linn. Soc. Lond., Zool. IX (1867), p. 317.

Cynthia morus Forb. (p. 86).

Cynthia morus Cocks Spec. Nat. Hist. Falmouth (1849), p. 11.

Cynthia echinata (L.) Ald. (p. 93).

? *Ascidia hispida* Cocks Spec. Nat. Hist. Falmouth (1849), p. 3.

Ascidia echinata Bosc Hist. nat. Vers, ed. 2 (1827), I, p. 120; M. Sars in Nyt Mag. f. Naturvid. VI (1851), p. 157; Danielssen in Nyt Mag. f. Naturvid. XI (1861), p. 48.

Ascidium echinatum Baird Cyclop. Nat. Sciences (1858), p. 561.

Cynthia echinata Lutkem in Vid. Medd. For. Kjöbenh. 1860, p. 206.

Styela tuberosa (Macg.) A. & H. (p. 103).

Styela tuberosa Hancock in Jrn. Linn. Soc. Lond., Zool. IX (1867), pp. 310–335 *passim*.

Cynthia tuberosa M. & G. O. Sars in Nyt Mag. f. Naturvid. XVII (1870), p. 214.

Styela quadrangularis (Forb.) A. & H. (p. 105).

Styela quadrangularis Gosse Year at the Shore (1865), p. 306, pl. xxxiv.

Styela mamillaris (Gaertn.) A. & H. (p. 106).

Ascidia papillosa Barbut Genera Vermium, pt. 1 (1783), p. 48, pl. v, f. 1.

Ascidia mamillaris Denys de Montfort in Buffon's Hist. nat. Moll. (1804), VI, p. 161; Oken Lehrb. Naturgesch. III, 1 (1815), p. 215; Bosc Hist. nat. Vers, ed. 2 (1827), I, p. 118.

? *Ascidia microcosmus* Johnston in Mag. Nat. Hist. VI (1833), p. 242.

Phallusia mamillaris Lœwig & Kœlliker in Ann. Sci. nat. (3) Zool. V (1846), pp. 193, 199, pl. v, ff. 1–4, and in Arch. Sci. phys. nat. III (1846), p. 297.

Cynthia papillata Berthold Lehrb. Zool. (1845), p. 517; Berthelot in Compt. rend. Acad. Sci. XLVII (1858), p. 229; Rupert Jones in Cyclop. Anat. IV, pt. 40 (1850), pp. 1198, 1199, f. 776; Bucholz in Zeits. f. wiss. Zool. XIX, 1 (1869), p. 149.

? *Cynthia microcosmus* Forbes in Rep. Brit. Assoc. for 1850 (1851), p. 241; Dickie in Rep. Brit. Assoc. for 1857 (1858), p. 111.

Ascidia microcosmus Quekett Lect. Histology, II (1854), p. 263, f. 146.

Ascidia papillata Chenu Encycl. Hist. nat. (1858), p. 246.

Styela mamillaris Hancock in Jrn. Linn. Soc. Lond., Zool. IX (1867), pp. 317, 335.

Scotland.—Hebrides (*Forbes*, 1850).

Styela pomaria (Sav.) A. & H. (p. 110).

Cynthia pomaria Meckel Syst. vergl. Anat. IV (1829), p. 167; Lœwig & Kœlliker in Ann. Sci. nat. (3) Zool. V (1846), p. 215, pl. vi, ff. 15, 17, 20, 22, 24.

Ascidia pomaria Grube Insel Lussin Meeresf. (1864), p. 51.

Styela variabilis A. & H. (p. 117).

Styela variabilis Hancock (MS. sp.) in Jrn. Linn. Soc. Lond., Zool. IX (1867), p. 318.

Styelopsis grossularia (Van Ben.) Traust. (p. 129).

Ascidia grossularia Troschel in Arch. f. Naturg. XIII, II (1847), p. 408; Thompson in Rep. Brit. Assoc. for 1852 (1853), p. 293.
Ascidia rustica Cocks Spec. Nat. Hist. Falmouth (1849), p. 157; Johnston Introd. Conch. (1850), p. 297.
Cynthia grossularia Gosse Year at the Shore (1865), p. 306, pl. xxxiv; M. & G. O. Sars in Nyt Mag. f. Naturvid. XVII (1870), p. 214.

Thylacium aggregatum (Rathke) V. Carus (p. 136).

Ascidia aggregata Kaup Thierreich (1837), p. 38.
Cynthia aggregata Forbes in Rep. Brit. Assoc. for 1850 (1851), p. 241; Rymer Jones Aquar. Naturalist (1858), p. 451; McAndrew & Barrett in Ann. Nat. Hist. (2) XVII (1856), p. 395; Hancock in Jrn. Linn. Soc. Lond., Zool. IX (1867), p. 317.

Pelonaia corrugata F. & G. (p. 145).

Pelonaia corrugata Cocks Spec. Nat. Hist. Falmouth (1849), p. 15; McAndrew & Barrett in Ann. Nat. Hist (2) XVII (1856), p. 385; Danielssen in Nyt Mag. f. Naturvid. XI (1861), p. 49; Hancock in Jrn. Linn. Soc. Lond., Zool. IX (1867), p. 334; M. & G. O. Sars in Nyt Mag. f. Naturvid. XVII (1870), p. 214.
Ascidia intestinalis Rymer Jones Aquar. Naturalist (1858), p. 452, pl. viii, f. 5.

Clavelina lepadiformis (O. F. Müll.) Sav. (p. 152).

Ascidia lepadiformis Bosc Hist. nat. Vers, ed. 2 (1827), I, p. 123.
Clavelina lepadiformis Fleming in Edinb. Philos. Journ. VIII (1823), p. 301; Audouin & Milne Edwards Hist. nat. Litt. France, I (1832), p. 143; Lœwig & Kœlliker in Ann. Sci. nat. (3) Zool. V (1846), p. 204, and in Arch. Sci. phys. nat. III (1846), p. 297; Cocks Spec. Nat. Hist. Falmouth (1849), p. 11; Roy. Coll. Surgeons Cat. Mus. ed. 2, I (1860), p. 262; Gosse Year at the Shore (1865), p. 302; Hancock in Jrn. Linn. Soc. Lond., Zool. IX (1867), p. 319.

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Clavelina Lewes Sea-side Studies (1858), p. 23, pl. i, f. 4.

England.—Ilfracombe, Devon (*Lewes*, 1858).

Perophora Listeri F. & H. (p. 158).

Perophera Listeri Cocks Spec. Nat. Hist. Falmouth (1849), p. 3; Gosse Nat. Hist., Moll. (1854), p. 316, fig.; Owen in Encycl. Brit. ed. 8, XI (1858), p. 332, f. 5; Gosse Year at the Shore (1865), p. 302; Frédol (Moquin-Tandon) Monde de la Mer, ed. 2 (1866), p. 249, fig., and (transl.) World of the Sea (1869), p. 179, fig.

Diazona violacea Sav. (p. 160).*

Polyclinum violaceum Goldfuss Handb. Zool. (1820), II, p. 592, and Grundz. Zool. (1826), p. 351.

Polyclina diazona Hoeven Handb. Dierk. II, 1 (1830), p. 30.

Diazona violacea Lœwig & Kœlliker in Ann. Sci. nat. (3) Zool. V (1846), p. 207, pl. v, f. 11; pl. vi, ff. 12, 13; pl. vii, f. 4; and in Arch. Sci. phys. nat. III (1846), p. 297; Johnston Introd. Conch. (1850), p. 299; H. & A. Adams Gen. Recent Moll. (1858), III, pl. cxxxv, ff. 5, 5*a*; Owen in Encycl. Brit. ed. 8, XV (1858), p. 332.

? *Leptoclinum violaceum* Eyton in Ann. Nat. Hist. (2) X (1852), p. 436.

? England.—Douglas Bay, Isle of Man (*Eyton*, 1852).

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Polyclinum aurantium M. Edw. (p. 2).

Polyclinum aurantium Hancock in Jrn. Linn. Soc. Lond., Zool. IX (1867), p. 325.

Amaroucium proliferum M. Edw. (p. 7).

Amaroucium proliferum Owen Comp. Anat. Invert. Anim. (1842), pp. 272, 274, ff. 116, 117; Quekett Lect. Histology, II (1854), p. 265, f. 149.

Amouroucium proliferum Cocks Spec. Nat. Hist. Falmouth (1849), p. 3.

* This species appeared as *Diazona hebridica* in the second volume, being the name adopted by Alder & Hancock, but, as there can be no doubt of the identity of the *Syntethys hebridicus* of Forbes & Goodsir with the *Diazona violacea* of Savigny, the older name is adopted here.

Amaroucium argus M. Edw. (p. 11).

Amaroucium Rymer Jones Aquarian Naturalist (1858), pl. viii, ff. 2, 2*a*.

Amaroucium Nordmanni M. Edw. (p. 14).

Amouroucium Nordmanni Cocks Spec. Nat. Hist. Falmouth (1849), p. 3.

Amaroucium fallax (Johnst.) A. & H. (p. 17).

Aplidium fallax Cocks Spec. Nat. Hist. Falmouth (1849), p. 3.

Aplidium ficus (Pall.) Sav. (p. 23).

Bouton-Gris Dicquemare in Obs. Physique, XXIII (1783), 2, p. 75, pl. ii.

Polyclinum ficus Goldfuss Handb. Zool. (1820) I, p. 591, and Grundr. Zool. (1826), p. 351.

Didemnum candidum Sav. (p. 35).

Polyclinum candidum Goldfuss Handb. Zool. (1820), I, p. 591.

Distoma rubrum Sav. (p. 38).

Distoma rubrum Risso Hist. nat. Europe mérid. (1826), IV, p. 278.

Distoma variolosum (Gaertn.) Sav. (p. 40).

Distoma variolosum Cocks Spec. Nat. Hist. Falmouth (1849), p. 11.

Botryllus Schlosseri (Pall.) Sav. (p. 54).

Alcyonium Schlosseri Pallas Reise sudlich. Statthalt. russich. Reichs, II (1801), p. 476.

Botryllus Schlosseri Goldfuss Handb. Zool. (1820) I, p. 592, and Grundr. Zool. (1826), p. 352; Leach Synops. Moll. Gt. Britain (1852), p. 242; Queketт Lect. Histology II (1854), p. 265, f. 150; Baird Cyclop. Nat. Sciences (1858), p. 78; Chenu Encycl. Hist. nat. (1858), p. 247.

Botryllus gemmeus Sav. (p. 68).

Botryllus Rymer Jones Aquarian Naturalist (1858), pl. viii, f. 1.

Botryllus gemmeus Frédol (Moquin-Tandon) Monde de la Mer, ed. 2 (1866), p. 251, fig., and (transl.) World of the Sea (1869), p. 180, fig.

Botryllus polycyclus Sav. (p. 71).

Botryllus polycyclus Goldfuss Handb. Zool. (1820) I, p. 593; Gosse Nat. Hist., Moll. (1854), p. 317.

Botrylloides Leachii (Sav.) M. Edw. (p. 77).

Botryllus Leachii Leach Synops. Moll. Gt. Britain (1852), p. 241.

England.—Between Dover and Sandgate, Kent (*Leach*, 1852).

Botrylloides radiata A. & H. (p. 82).

Botrylloides radiata Hancock in Jrn. Linn. Soc. Lond., Zool. IX (1867), p. 326.

? Botryllus conglomeratus Gaertn. (p. 87).

Botryllus conglomeratus Cuvier Tabl. élém. Anim. (1798), p. 656; Fleming Moll. Anim. (1837), p. 214; Leach Synops. Moll. Gt. Britain (1852), p. 243.

Alcyonium conglomeratum Turton Gen. Syst. Nat. (1802 and 1806), IV, p. 655.

England.—"Diamond Rock," east of Hastings, Sussex (*Leach*, 1852).

List of the Species described in this Monograph, with the Genera under which they would probably now be placed.

SOLITARIÆ.

Ascidiadæ.

Ascidia mamillata	*Phallusia*
„ mentula	*Ascidia*
„ robusta	„
„ rubicunda	„
„ rubrotincta	„
„ crassa	„
„ mollis	„
„ plana	„
„ Alderi	„
„ rudis	„
„ venosa	*Ascidiella*
„ producta	*Ascidia*
„ inornata	„
„ depressa	„
„ elongata	*Ascidiella*
„ aculeata	„
„ amœna	„
„ plebeia	*Ascidia*
„ sordida	*Ascidiella*
„ canina	*Ciona*
„ obliqua	*Ascidiella*
„ Morei	„
„ scabra	„
„ Normani	„
„ affinis	„
„ pustulosa	„
„ elliptica	„
„ pellucida	„
„ orbicularis	„
„ vitrea	„
Ciona intestinalis	*Ciona*
„ pulchella	„
„ fascicularis	„
Corella parallelogramma	*Corella*
„ larvæformis	„
„ ovata	„

Molgulidæ.

Molgula conchilega	*Molgula*
„ complanata	*Ctenicella*
„ oculata	*Molgula*
„ valvata	„
„ simplex	„
„ siphonata	„
„ socialis	„
„ inconspicua	„
„ citrina	„
Eugyra arenosa	*Eugyra*
„ globosa	„

Cynthiadæ.

Cynthia rosea	*Cynthia*
„ claudicans	„
„ squamulosa	„
„ ovata	„
„ morus	„
„ tessellata	*Forbesella*
„ limacina	„
„ echinata	*Cynthia*
Styela tuberosa	*Polycarpa*
„ informis	*Styela*
„ quadrangularis	*Polycarpa*
„ mamillaris	*Styela*
„ opalina	„
„ coriacea	*Polycarpa*
„ pomaria	„
„ sulcatula	*Styela*
„ granulata	„
„ humilis	*Polycarpa*
„ variabilis	*Styela*
„ obscura	*Polycarpa*
„ comata	„
„ vestita	*Styela*
„ violacea	„
„ fibrillata	*Polycarpa*

CYNTHIADÆ (*continued*).

Styela depressa	*Polycarpa*
„ northumbrica	*Styela*
Styelopsis grossularia	*Styelopsis*
„ sphærica	„
„ lineata	„
„ glomerata	*Polycarpa*
Thylacium aggregatum	*Thylacium*
„ Sylvani	„
„ Normani	„
Thylacium variolosum	*Distoma*
Pelonaia corrugata	*Pelonaia*
„ glabra	„

CLAVELINIDÆ.

Clavelina lepadiformis	*Clavelina*
„ producta	„
„ corrugata	„
Perophora Listeri	*Perophora*
Diazona violacea	*Diazona*

AGGREGATÆ.

POLYCLINIDÆ.

Polyclinum aurantium	*Polyclinum*
„ succineum	„
„ cerebriforme	„
Amaroucium proliferum	*Amaroucium*
„ albicans	„
„ papillosum	„
„ argus	*Morchellium*
„ edentulum	*Amaroucium*
„ Nordmanni	„
„ pomum	„
„ fallax	*Aplidium*
Parascidia Forbesii	*Parascidia*
„ Flemingii	„
„ flabellata	„
Aplidium ficus	*Polyclinum*
„ melleum	*Aplidium*
„ glomeratum	„
„ nutans	„
Sidnyum turbinatum	*Sidnyum*

DIDEMNIDÆ.

Didemnum gelatinosum	*Diplosoma*
„ candidum	*Didemnum*
Distoma rubrum	*Distoma*
„ variolosum	„
„ vitreum	„
Leptoclinum maculosum	*Leptoclinum*
Leptoclinum asperum	*Leptoclinum*
„ durum	„
„ fulgens	„
„ gelatinosum	*Diplosoma*
„ punctatum	„
„ Listerianum	„

BOTRYLLIDÆ.

Botryllus Schlosseri	*Botryllus*
„ rubens	„
„ virescens	„
„ smaragdus	„
„ gemmeus	„
„ violaceus	„
„ badius	„
„ polycyclus	„
„ castaneus	„
„ caliculatus	„
„ bivittatus	„
„ miniatus	„
Botrylloides Leachii	*Botrylloides*
„ rubrum	„
„ albicans	„
„ vinosa	„
„ radiata	„
„ rotifera	„
„ ramulosa	„
„ sparsa	„
„ pusilla	„
Botryllus conglomeratus	?

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† The various spellings of this word are not indexed.

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ERRATA AND CORRIGENDA.

Vol. I, page 8, line 12, for *Clavellina* read *Clavelina*.
,, ,, ,, 17, lines 14 and 15, for *Clavellina* read *Clavelina*.
,, ,, ,, 76, ,, 1, 3, and 10, for *monarchus* read *monachus*.
,, ,, ,, 146, line 10 from bottom, for *monarchus* read *monachus*.
,, ,, ,, ,, last line, *for* Solitaria 64 *read* Solitariæ 63.
,, II ,, 9, line 7, *for* Plate I *read* Plate XXI.
,, ,, ,, ,, ,, 10 from bottom, *for* Pergestina *read* Tergestina.
,, ,, ,, 10, lines 13 and 14 from bottom, should be transferred to Vol. I, p. 122, Dicquemare's *Sacanimal* being *Ciona canina*, the *Ascidia canina* of this monograph.
,, ,, ,, 14, ,, 8, *for* Plate I *read* Plate XXI.
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,, ,, ,, 28, ,, 17, *for* fig. 8 *read* fig. 9.
,, ,, ,, 73, ,, 18, *for* Plate XXVIII *read* Plate XXIX.
,, ,, ,, 115, ,, 3 from bottom, and p. 116, l. 4, for *sulcata* read *sulcatula*.
,, ,, ,, 138, *Thylacium variolosum* is again described, as *Distoma variolosum*, in Vol. III, p. 40. See remarks at bottom of p. 42. For other alterations required in generic names see pp. 103–104.
,, ,, ,, 160, *Diazona hebridica* should have been described as *Diazona violacea*. See foot-note on that page and also on p. 100 of the present volume.

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The State of Zoology in Europe, as regards the Vertebrata. By C. L. Bonaparte. Transl. by H. E. Strickland. pp. 1–44.

The Progress of Zoology in 1842. Transl. from the German by W. B. Macdonald. pp. 1–348.

The Progress of Physiological Botany in 1841. By H. F. Link. Transl. by Edwin Lankester. pp. 1–104. Index, pp. i–xx.

2. A Monograph of the British Nudibranchiate Mollusca. By Joshua Alder and Albany Hancock. Part I. x + 20 pp., 10 plates. Folio. 1845.

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5. A Monograph of the British Nudibranchiate Mollusca. By Joshua Alder and Albany Hancock. Part II. iv + 34 pp., 13 plates. Folio. 1846.

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Report on Botanical Geography, 1842. By A. Grisebach. Transl. by W. B. Macdonald. pp. 55–212.

Memoir on the Nuclei, Formation, and Growth of Vegetable Cells. By Carl Nägeli. Transl. by Arthur Henfrey. pp. 213–292, 445–459, pls. vi, vii.

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Progress of Zoology in 1843. pp. 1–232.
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14. The Correspondence of John Ray. Edited by Edwin Lankester. xvi + 502 pp., 2 plates. 8vo. 1848.

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On the Structure of the Palm-stem. By H. von Mohl. pp. 1–92, 495, pl. i.

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On the Utricular Structures in the Contents of Cells. By Carl Nägeli. pp. 159–190.

Report on Physiological Botany for 1844 and 1845. By H. T. Link. pp. 191–314.

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Report on Geographical and Systematic Botany for 1845. By A. Grisebach. pp. 415–494.

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25. A Monograph of the Sub-class Cirripedia. By Charles Darwin. The Balanidæ, the Verrucidæ, etc. viii + 684 pp., 30 plates. 8vo. 1854.

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38. A Monograph of the British Spongiadæ. By J. S. BOWERBANK. Vol. II. xx + 388 pp. 8vo. 1866.

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44. The Miscellaneous Botanical Works of Robert Brown. [Edited by John J. Bennett.] Vol. III. Atlas of Plates. iv + 16 pp., 38 plates. Folio. 1868.

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47. A Monograph of the Gymnoblastic or Tubularian Hydroids. By George James Allman. Conclusion of Part I, and Part II, containing descriptions of the Genera and Species of the Gymnoblastea. iv + 2 (xxiii, xxiv) + 296 (155–450) + 22 pp., 11 plates (xiii–xxiii). Folio. 1872.

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